The 3rd Annual Emerging Information Technology Conference

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

October 31 - November 1, 2003,
Friend Center, Princeton University,
Princeton, New Jersy, U.S.A.

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Welcome Message

It is our pleasure to welcome you to the Emerging Information Technology Conference, EITC 2003. This conference is held annually to facilitate information exchange among professionals from the Pacific Rim and North America on new information technologies. Its objectives are to strengthen the technical and business ties between the Pacific Rim and North American information technology industries, to bring together experts and industry leaders to share technological advancements and business experiences, and to jointly explore opportunities in emerging information technologies.

The organizing committee, under the capable leadership of Michael Hwa Han Wang, has again put together a very interesting and eclectic program. This year, we have added a new program track, called C4I, which stands for "Content, Computer, Communications, Consumer Electronics, and Integration". This is in addition to the four program tracks we had last year in Nanotechnology, MEMS, System on a Chip (SOC) and Bioinformatics. In total, we have 18 technical sessions in parallel tracks, four plenary sessions and two keynotes. On behalf of the organizing committee, including conference organizers Tsu-Han Chen and Sun-Yuan Kung, we would like to thank the program track chairs for their outstanding efforts in putting together this program. They are Chi-Chang Kao (Nanotechnology), Darrin J. Young (MEMS), Howard Chen (SoC), Sue-Jane Wang (Bioinformatics) and Rong Chang (C4I).

The work of the organizing committee was particularly difficult this year because of the SARS epidemic. This caused great uncertainty as to whether EITC could even be held this year. Fortunately, SARS appeared to be under control by the end of the summer, and we decided to proceed as planned. Many thanks to all involved for their patience and perseverance.

This year, we also mourn the sudden death of a key member of the EITC team, Dr. Mow Lin, who was the conference co-organizer of EITC 2003. Dr. Lin was a distinguished scientist at the Energy Sciences and Technology Department at Brookhaven National Laboratories. Mow was also a very active partner for many technical activities, and will be fondly missed.

We wish to thank our major sponsors, the Investment & Trade Office and the Science Division, TECRO. We thank the entire EITC team for putting together this excellent program with so many technical experts and industrial leaders from both sides of the Pacific. We also want to express our appreciation to all the speakers for preparing their talks and coming to share their expertise. Last, but not least, we thank the Chinese Student Associations for their enthusiastic help in the local arrangements for EITC 2003 at the Princeton University campus. Enjoy the conference, and enjoy your visit to Princeton!

Ruby Lee, Princeton University
Conference Co-Chair

Chintay Shih, Industrial Technology Research Institute
Conference Co-Chair

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 optical, chemical, biological, 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; and chemical "lab on a chip" for biomedical applications.

To further this vision the third 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 cell phones, DVD players, and digital cameras, which brought revolutionary changes to the IT industry.

The system-on-chip track of EITC-2003 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 reconfigurable systems.

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 an emerging discipline in the computational sciences. It 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.

Bioinformatics Track of EITC-2003 will be dedicated to talks from the academics and industry experts to address critical issues and stimulate ideas in addition to acknowledge its recent advances. It will engage dialogues across disciplines and invite discussions in the forefront of the exciting biomedical frontier.

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

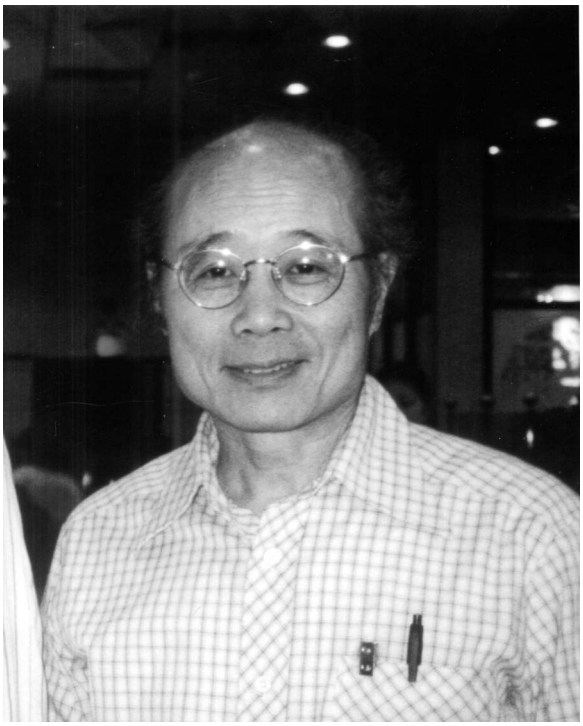
Advances in computing and communications technologies are significantly driving the change of everyone's life style and the transformation of every organization's operations and business management processes. Many people now cannot go out without carrying a mobile phone. In average, people are spending less time in watching TV than using the Web browser chatting with others, composing/ replying personal email, surfing/ searching the Web hypermedia library, buying hard/ soft goods, playing games, etc. Organizations in the world are expanding the scope of their IT outsourcing from managed computing infrastructure (including managed network, server, and/ or storage) to business process management. Big U.S. companies, in particular, are seriously executing offshore and near-shore IT outsourcing strategies to make them more competitive in the global market.

The C4I (Content, Computer, Communications, Consumer electronics, and Integration) workshop will bring together industry leaders and IT experts to share their insightful views of the IT industry in the era of on demand computing, in which IT resources can be provisioned in an on demand fashion and can be offered via a usage-based pricing scheme. The workshop will take a deep look at the challenges of exploiting and managing the computing environment in which millions of organizations and billions of people are connected by trillions of media-processing devices. It will examine how security and privacy issues should be addressed in the design of an IT system to facilitate rapid adoption of new technologies on information/ knowledge capturing, analysis, integration, and dissemination. Finally, it will review emerging standard-based network computing and application/ process integration technologies such as Grid, Web Services, etc.

In Memory of

Dr. Mow-Shiah Lin

July 12, 1941 —
September 12, 2003



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Conference Program

	October 31, 2003 (Friday)	November 1, 2003 (Saturday)
08:00 AM to 09:00AM	**Registration**	**Registration**
09:00 AM to 09:50 AM	**Opening Remarks**	**Opening Remarks**
09:50 AM to 10:50 AM	P1 - Plenary Session I: **Nanotechnology**	P3 - Plenary Session III: **System-on-Chip**
10 Minutes	**Break**	**Break**
11:00 AM to 12:20 PM	P2 – Plenary Session II: **MEMS**	P4 – Plenary Session IV: **Bioinformatics**
12:30 PM to 02:00 PM	**Luncheon**	**Luncheon**
(Parallel) 02:00 PM to 03:45 PM	T1 – Technical Session 1: **Nanotechnology (I)**	T11 – Technical Session 11: **System-on-Chip (III)**
	T2 – Technical Session 2: **MEMS (I)**	T12 – Technical Session 12: **Bioinformatics (III)**
	T3 – Technical Session 3: **System-on-Chip (I)**	T13 - Technical Session 13: **C4I (III): Multi-Service Communications**
	T4 – Technical Session 4: **Bioinformatics (I)**	T14 – Technical Session 14: **C4I (IV): Information and Knowledge Management**
	T5 – Technical Session 5: **C4I (I): IT and Business Process Outsourcing**	
30 Minutes	**Break**	**Break**
(Parallel) 4:15 PM to 6:00 PM	T6 – Technical Session 6: **Nanotechnology (II)**	T15 – Technical Session 15: **System-on-Chip (IV)**
	T7 – Technical Session 7: **MEMS (II)**	T16 – Technical Session 16: **Bioinformatics (IV)**
	T8 – Technical Session 8: **System-on-Chip (II)**	T17 – Technical Session 17: **C4I (V) : Ubiquitous Communications and Computing**
	T9 – Technical Session 9: **Bioinformatics (II)**	T18 – Technical Session 18: **C4I (VI): Human-Computer Integration**
	T10 – Technical Session 10: **C4I (II): On Demand Computing Technologies**	

Day 1 (October 31, 2003)

08:00-09:00 AM Registration

09:00-09:50 AM Opening Remarks
Conference Organizer: Sun-Yuan Kung, Princeton University
Conference Chair: Chintay Shih, Industrial Technology Research Institute (ITRI)

Keynote Speaker:

"Transition of IT Industry in Taiwan"
Chintay Shih, Industrial Technology Research Institute (ITRI)

09:50-10:50 AM P1 - Plenary Session I: Nanotechnology
Chair: Chi-Chang Kao, Brookhaven National Lab

"High Temperature Operation (~240 K) of InAs/GaAs and Silicon-Germanium Quantum Dot Infrared Photodetectors (QDIP)"
Si-Chen Lee, National Taiwan University
"DOE's Nanoscale Science Research Centers"
Robert Hwang, Brookhaven National Lab

10:50-11:00 AM Break

11:00 AM-12:20 PM P2 – Plenary Session II: MEMS
Chair: Darrin J. Young, Case Western Reserve University

"Nano- and Microscale BioPOEMS"
Luke P. Lee, University of California at Berkeley
"Integration of a Microsystem for Chemical and Biological Sensing"
Chung-Chiun Liu, Case Western Reserve University
"Optical MEMS at Micro and Nano Scale"
Ming C. Wu, University of California at Los Angeles

12:30-02:00 PM Luncheon

02:00-03:45 PM Parallel Technical Sessions

T1 – Technical Session 1: Nanotechnology (I)
Chairs: Si-Chen Lee, National Taiwan University
Howard F. Lee, NanoOpto

"Towards Enabling Materials Design for Low-Cost Plastic Transistors"
Beng Ong, Xerox Research Centre of Canada
"Magnetic Nanoparticle Arrays for Information Technology Applications"
Shouheng Sun, IBM T. J. Watson Research Center
"Nanoscale Functionalization Strategies"
Stanislaus Wong, Brookhaven National Lab
Jim Wang, NanoOpto

T2 – Technical Session 2: MEMS (I)
Chair: Luke P. Lee, University of California at Berkeley

"Integration of MEMS and Planar Waveguide Technologies for Lightwave Switching"
Ho Bun Chan, Lucent Technologies
"A Micromachined Touch-Mode Tunable Capacitor for Wireless Communications"

Darrin J. Young, Case Western Reserve University
"Development of High Fill-factor Micromirror Scanners for Adaptive Optics"
Veljko Milanovic, Adriatic Research Institute

T3 – Technical Session 3: System-on-Chip (I)
Chair: Wei Hwang, National Chiao-Tung University

"Some Challenges for Low-Power System-On-a-Chip"
Suhwan Kim, IBM T. J. Watson Research Center
"Power Management for nano-CMOS System-on-Chip Designs: the Problem, the Trend, and the Solution"
Herming Chiueh and Wei Hwang, National Chiao-Tung University
"CoMoC (Communication on a Chip): A Systematic Approach to Solve On-Chip Global Communication Problem in SoC"
Yu-Hen Hu, University of Wisconsin at Madison
"Si-Based RF SoC/ SoP For Wireless Communication"
Chien-Nan Kuo and Yu-Ting Cheng, National Chiao-Tung University

T4 – Technical Session 4: Bioinformatics (I)
Chair: Cheng-Yan Kao, National Taiwan University
Room: 008

Thomas Wu, Genentech
Ying Xu, University of Georgia
"Distance-Based Genome Rearrangement Phylogeny"
Li-San Wang, University of Pennsylvania
"ArrayTrack – Supporting Toxicogenomic Research at the FDA's National Center for Toxicological Research (NCTR)"
Weida Tong, NCTR, FDA

T5 – Technical Session 5 (Panel): C4I (I): IT and Business Process Outsourcing
Chair: Kuan-Tsae Huang, Taskco Corp.

Deng Chyan Chen, Institute for Information Industry (III)
Hsin-Kuo Kan, AT&T Labs
Chintay Shih, Industrial Technology Research Institute (ITRI)
Ko-Yang Wang, IBM Global Services
Chung-Shu Yang, AT&T Labs

03:45-04:15 PM Break

04:15-06:00 PM Parallel Technical Sessions

T6 – Technical Session 6: Nanotechnology (II)
Chairs:Benjamin Chu, State University of New York at Stony Brook
Benjamin S. Hsiao, State University of New York at Stony Brook

"The Abnormal Densities of Poly(L-lactic) Acid and Its Implication on Primary Nucleation"
Jing Wu, New Jersey Institute of Technology
"Self-Assembly of a Novel Asymmetrical Bolaamphiphile: Acidic Sophorolipid Molecules"
Shiquin Zhou, College of Staten Island and the Graduate Center, the City University of New York
"Nanostructured Materials for Advanced Sensor Technology"
Chuan-Jian Zhong, State University of New York at Binghamton
"Crystallization in Nano-Confinement Cylinder and Double Gyroid Environments"
Lei Zhu, the University of Connecticut

"New Nanoparticle Catalysts For Fuel Cells"
Jin Luo, State University of New York at Binghamton
"Hierarchical assembly of a Series of Rod-Coil Block Copolymers: Supramolecular LC Phase in Nanoenviroment"
Christopher Y. Li, Drexel University

T7 – Technical Session 7: MEMS (II)
Chair: Susan Z. Hua, State University of New York at Buffalo

"Magnetic Colloids: From Nanostructures to Complex Systems"
Weili Luo, University of Central Florida
"Design and Microfabrication of Bio-AFM Cantilevers/ Tips"
Xiaoyu Yang, Novascan Technologies, Inc
"Sequential Electrolytic Bubble-Based Micro-Pump"
Susan Z. Hua, State University of New York at Buffalo

T8 – Technical Session 8: System-on-Chip (II)
Chair: Yu-Hen Hu, University of Wisconsin at Madison

"Baseband Signal Processing IC for Wireless Communication Systems"
Tzi-Dar Chiueh, National Taiwan University
"Characterization of Logic Circuit Techniques for High Leakage CMOS Technologies"
Phillip Chin, Charles Zukowski, Columbia University, and
George Gristede, IBM T.J. Watson Research Center
"A Formal Verification Platform for SoC"
Pao-Ann Hsiung, National Chung-Cheng University

T9 – Technical Session 9: Bioinformatics (II)
Chair: Thomas D. Wu, Genentech Inc.

"Medical Genomics and Genome Medicine: a computational practice"
Simon Lin, Duke University
"Normalization for cDNA Microarray Experiments having many Differentially Expressed Genes"
I-Shou Chang, National Health Research Institutes (NHRI)
Ben Hui Liu, Bio-Informatics Group, Inc
Xiaole Liu, Harvard University

T10 – Technical Session 10: C4I (II): On Demand Computing Technologies
Chair: C. Eric Wu, IBM T.J. Watson Research Center

"IBM On-Demand Computing"
Tan Lu, IBM On Demand Systems Environment
"Proactive and Autonomic Computing: A Software-enabling Platform for the Enterprise"
Andy Lean, Sequoia Broadband, Inc.
"On-Demand Business Collaboration "
Tian Chao, IBM T.J. Watson Research Center
"On-Demand Business Process Monitoring & Management"
Jun-Jang Jeng, IBM T.J. Watson Research Center

Day 2 (November 1, 2003)

08:00-09:00 AM Registration

09:00-09:50 AM Opening Remarks
Conference Organizer: Tsu-Han Chen, Carnegie Mellon University
Conference Chair: Ruby Lee, Princeton University

Keynote Speaker:

"Architecture for Cyber Security"
Ruby Lee, Princeton University

09:50-10:50 AM P3 - Plenary Session III: System-on-Chip
Chair: Howard Chen, IBM T. J. Watson Research Center

Tsu-Han Chen, Carnegie Mellon University
"System-on-a-chip Synthesis"
Niraj Jha, Princeton University

10:50-11:00 AM Break

11:00 AM-12:20 PM P4 – Plenary Session IV: Bioinformatics
Chair: Sue-Jane Wang, Food and Drug Administration

"Large-Scale Phylogenetic Reconstruction"
Tandy Warnow, University of Pennsylvania
"Bioinformatics and Pattern Discovery at IBM"
Dan Platt, IBM T. J. Watson Research Center
"A Regulatory Perspective of Bioinformatics Data Generated for Pharmacogenomics and Pharmacogenetics Studies"
Sue-Jane Wang and Larry Lesko, Food and Drug Administration

12:30-2:00 PM Luncheon

02:00-03:45 PM Parallel Technical Sessions

T11 – Technical Session 11: System-on-Chip (III)
Chair: Sao-Jie Chen, National Taiwan University

"Overview of NTU SOC Center"
Sy-Yen Kuo, National Taiwan University
"PowerHerd: A Distributed Scheme for Dynamically Satisfying Peak Power Constraints in Interconnection Networks"
Li Shang, Princeton University
"Design and Implementation of a Parallel Processor IC for Job Shop Scheduling"
Kuan-Hung Chen, Tzi-Dar Chiueh, Shi-Chung Chang, National Taiwan University, and Peter Luh, University of Connecticut

T12 – Technical Session 12: Bioinformatics (III)
Chair: Clive E. Bowman, GlaxoSmithKline

"Impact of Genetic HAP Markers to Outcomes in Prospective Clinical Trials"
Chuanbo Xu, Genaissance Pharmaceuticals, Inc.
"A Novel Way to Find the Most Discriminant Gene Sets on Microarray"
Cheng-Yan Kao, National Taiwan University

"A Novel Pattern Recognition for Microarray Data Analysis"
Huixiao Hong, Bioinformatics Lab., NCTR, FDA
Kim Zerba, Bristol-Myers Squibb Inc.

T13 - Technical Session 13: C4I (III): Multi-Service Communications
Chair: Yih-Kang (Maurice) Lin, AT&T Labs

"Network Convergence"
Margaret Chiosi, AT&T Labs
"Future Evolution in Local Access Technology and Telephony Services"
Irwin Gerszberg, AT&T Labs
"Autonomic Management of Multi-service Computing Utilities"
Liana Fong, IBM T. J. Watson Research Center
"Network based VPN Services – MPLS VPN"
Luyuan Fang, AT&T Labs

T14 – Technical Session 14: C4I (IV): Information and Knowledge Management
Chair: Zon-Yin Shae, IBM T.J. Watson Research Center

"On Visual Similarity Based 3D Model Retrieval"
Ming Ouhyoung, National Taiwan University
"E-Commerce Value Chain Business Transformation"
Jih-Shyr Yih, IBM T.J. Watson Research Center
"From Information to Business Process Management"
Shih-Ping Liou, Siemens Corporate Research
"Privacy Protection on Information Management"
Xuan Liu, IBM T.J. Watson Research Center

03:45-04:15 PM Break

04:15-06:00 PM Parallel Technical Sessions

T15 – Technical Session 15: System-on-Chip (IV)
Chair: Michael S. Hsiao, Virginia Tech.

"Low-Complexity/ High-Speed Forward Error Correction Architecture for Optical Communications"
Hanho Lee, University of Connecticut
"Testing High-Frequency Serial Communication Interfaces in the SoCs"
Jien-Chung Lo, University of Rhode Island
"Constrained Transition Fault ATPG to Reduce Yield Loss in SOCs"
Xiao Liu and Michael S. Hsiao, Virginia Tech.
"Open Architecture ATE: Software Considerations"
Yuhai Ma, Advantest America, Inc.

T16 – Technical Session 16: Bioinformatics (IV)
Chair: Simon M. Lin, Duke University

Tony Kong, Rutgers, The State University of New Jersey
"An Integrated Bioinformatics Approach for Proteomic Expression Analysis of Clinical Samples and Its Application to Biomarker Discovery "
Zhen Zhang, Johns Hopkins Medical Institute
"UniMarker as a Fast Sequence Mapping and Genome Comparison Method"
Ming-Jing Hwang, Institute of Biomedical Sciences, Academia Sinica
"SNPs – from Technology to Application"
Clive, E. Bowman, GlaxoSmithKline

T17 – Technical Session 17: C4I (V) : Ubiquitous Communications and Computing

Chairs:Sing Lin, CSC Research LLC
Jung-Tao Liu, Lucent Technologies

"Convergence of Communications"
Anwar Siddiqui, Avaya
"Wi-Fi Based Public Wireless LAN"
Martin Eisenschmeid, AT&T Labs
"Pervasive Computing Solutions"
Paul Chou, IBM T.J. Watson Research Center
"Mobile Media and Home Networking - Driving the Convergence of Computing and Communications"
Heather Yu, Panasonic Research
"Variable-Phase-Shift-Based RF-Baseband Codesign for MIMO Antenna Selection"
Xinying Zhang, Princeton University

T18 – Technical Session 18: C4I (VI): Human-Computer Integration

Chair: Michelle Yan, Siemens Corporate Research

"What is the Next Big Thing after Search?"
James Shaw, IBM T.J. Watson Research Center
"Augmented Reality and Its Industrial Applications"
Zhang Xiang, Siemens Corporate Research
"Virtually Physical Whiteboards and Ink Instant Messaging"
Zon-Yin Shae, IBM T.J. Watson Research Center
"Machine Recognition of Human Faces"
Wen-Yi Zhao, Sarnoff

Abstracts and Biographies

Conference Organizers

Sun-Yuan Kung

Princeton University

BIOGRAPHY

Sun-Yuan Kung received his Ph.D. Degree in Electrical Engineering from Stanford University. Since 1987, he has been a Professor of Electrical Engineering at the Princeton University. In 1974, he was an Associate Engineer of Amdahl Corporation, Sunnyvale, CA. From 1977 to 1987, he was a Professor of Electrical Engineering-Systems of the University of Southern California, L.A. In 1984, he was a Visiting Professor of the Stanford University and the Delft University of Technology. In 1994 he was a Toshiba Chair Professor at Waseda University, Japan, and a Honorary Professor, Central China University of Science and Technology, China. In 2001, he was a Distinguished Chair of Multimedia Signal Processing, Hong Kong Polytechnic University, Hong Kong. His research interests include VLSI array processors, image/ video/ multimedia signal processing, neural networks for biometric and bioinformatic signal processing, and wireless digital communication.

Since 1990, he has served as an Editor-In-Chief of Journal of VLSI Signal Processing Systems. He was appointed as the first Associate Editor in VLSI Area (1984) and the first Associate Editor in Neural Network (1991) of the IEEE Transactions on Signal Processing. He served as a member of IEEE SPS (Signal Processing Society) Administration Committee (1989-1991). He was a founding member of IEEE-SPS Technical Committees (TC) on VLSI Signal Processing, TC on Neural Networks, and TC on Multimedia Signal Processing. He served as a founding member and General Chairman of various international conferences, including IEEE Workshops on VLSI Signal Processing, IEEE Workshops on Neural Networks and Signal Processing, IEEE Workshops on Multimedia Signal Processing, International Conference on Application Specific Array Processors, and International Computer Symposium.

Professor Kung has authored more than 300 technical publications. He has authored three books ‘‘VLSI Array Processors”, (P-H, 1988) (with Russian and Chinese translations); ‘‘Digital Neural Networks”, P-H, 1993; and ‘‘Principal Component Neural Networks”, John-Wiley, 1996. He has edited numerous reference books, including: "VLSI and Modern Signal Processing," Prentice-Hall, 1985. (with Russian translation), ‘‘VLSI Signal Processing, Vol.I&II (IEEE Press), ‘‘Neural Networks for Signal Processing, Vol. I,II & III (IEEE Press), ‘‘Multimedia Signal Processing, Vol. I (IEEE Press) and ‘‘Systolic Arrays”, 1988, ‘‘Application-Specific Array Processors, (IEEE Computer Society Press). He has recently co-edited a book on ‘‘Multimedia Image and Video Processing”, CRC Press, 2001.

Dr. Kung is a Fellow of IEEE since 1988. He was the recipient of 1992 IEEE Signal Processing Society’s Technical Achievement Award for his contributions on "parallel processing and neural network algorithms for signal processing". He was appointed as an IEEE-SP Distinguished Lecturer in 1994. He received 1996 IEEE Signal Processing Society’s Best Paper Award for his publication on principal component neural networks. He was a recipient of the IEEE Third Millennium Medal in 2000.

Conference Organizers

Tsuhan Chen

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BIOGRAPHY

Tsuhan Chen has been with the Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, Pennsylvania, since October 1997, where he is now a Professor. He directs the Advanced Multimedia Processing Laboratory, striving to turn multimedia technologies from science fiction into reality. He also established and is the current director of the "ITRI Lab at CMU," a collaborative research laboratory sponsored by Industrial Technology Research Institute (ITRI), at one million dollars a year, with research focus on System-on-Chip (SoC) and multimedia/security applications. His research interests include multimedia signal processing and communication, implementation of multimedia systems, multimodal biometrics, audio-visual interaction, pattern recognition, computer vision and computer graphics, bioinformatics, and building collaborative virtual environments. From August 1993 to October 1997, he worked in the Visual Communications Research Department, AT&T Bell Laboratories, Holmdel, New Jersey, and later at AT&T Labs-Research, Red Bank, New Jersey, as a senior technical staff member and then a principle technical staff member.

Tsuhan helped create the Technical Committee on Multimedia Signal Processing, as the founding chair, and the Multimedia Signal Processing Workshop, both in the IEEE Signal Processing Society. His endeavor later evolved into the founding of the IEEE Transactions on Multimedia and the IEEE International Conference on Multimedia and Expo, both joining the efforts of multiple IEEE societies. He is appointed the Editor-in-Chief for IEEE Transactions on Multimedia for 2002-2004.

Before serving as the Editor-in-Chief for IEEE Transactions on Multimedia, he also served in the Editorial Board of IEEE Signal Processing Magazine and as Associate Editor for IEEE Trans. on Circuits and Systems for Video Technology, IEEE Trans. on Image Processing, IEEE Trans. on Signal Processing, and IEEE Trans. on Multimedia. He has co-edited a book titled Advances in Multimedia: Systems, Standards, and Networks.

Tsuhan received the B.S. degree in electrical engineering from the National Taiwan University in 1987, and the M.S. and Ph.D. degrees in electrical engineering from the California Institute of Technology, Pasadena, California, in 1990 and 1993, respectively. He received the Charles Wilts Prize for outstanding independent research in Electrical Engineering leading to a Ph.D. degree at the California Institute of Technology. He has published more than a hundred of technical papers and holds fifteen U.S. patents. He is a recipient of the National Science Foundation CAREER Award, titled "Multimodal and Multimedia Signal Processing," from 2000 to 2003.

Conference Chairs

Chintay Shih

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BIOGRAPHY

Education:

Ph.D.	Electrical Engineering , Princeton University	1975
M.S.	Management, Stanford University	1985
B.S.	Electrical Engineering, National Taiwan Univ.	1968

Experience:

President of ITRI	1994～2003
Vice President of ITRI	1989～1994
VP & General Director of ERSO/ ITRI	1984～1989
Engineer Manager, Plant Manager of IC Center, Deputy General Director of ERSO/ ITRI	1976～1984
Senior Engineer, Burroughts, USA	1974～1976

Current Position

Special Advisor of ITRI	2003

Recent advisory positions:

Science &Technology Advisor of the Executive Yuan since 1998
Chairman of the Asia Pacific Intellectural Property Association since 1997
President of Chinese Business Incubation Association since 2003

Conference Chairs

Ruby Lee

Princeton University

BIOGRAPHY

Professor 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 architecture at both the global GRID architecture level and the core processor architecture level. She has also designed PLX, a very fast, tiny, multimedia-capable processor for information appliances, and her students are continuing to improve the PLX test-bed for processor architecture research, education and automatic synthesis. Her group explores the design of security features that can be integrated into microprocessors, application-specific instruction processors (ASIPs) and system-on-chips (SOCs). Her research also includes architecture for very high-performance microprocessors and supercomputers on a chip. Prof. Lee teaches an undergraduate course in "Cyber Security" and a graduate course in "Processor Architectures for New Paradigms."

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 initial definition and the evolution of the PA-RISC processor architecture used in HP servers and workstations. She was the technical lead in the first CMOS PA-RISC microprocessor. 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. She pioneered the introduction of multimedia instructions in microprocessors. This enabled her multimedia team to produce the industry's first real-time, high fidelity, streaming MPEG video and audio product implemented entirely in software on low-end computers. Dr. Lee also co-led an Intel-HP multimedia architectural team for IA-64, recently released in Intel's Itanium microprocessors.

Concurrent with full-time employment at HP, Dr. Lee also served as Consulting Professor of Electrical Engineering at Stanford University. Dr. Lee has a Ph.D. in Electrical Engineering and a M.S. in Computer Science and Computer Engineering, both from Stanford University, and an A.B. with distinction from Cornell University, where she was elected a College Scholar. She is a Fellow of the Association for Computing Machinery (ACM), a Fellow of the Institute for Electrical and Electronic Engineers (IEEE), and a member of Phi Beta Kappa and Alpha Lambda Delta. She has been granted 115 U.S. and international patents, with several patent applications pending.

Conference Program Chairs

Dr. Chi-Chang Kao

Senior Scientist
Brookhaven National Laboratory

BIOGRAPHY

Education

Ph.D., Cornell University, Ithaca, N.Y., 1988

Experience

Dr. Kao's research interest has been in the development of new experimental techniques using synchrotron radiation, and their applications to condensed matter physics and material science. In particular, he has been working on the development of soft-x-ray resonant magnetic scattering for magnetism and magnetic material research, and high-resolution inelastic x-ray scattering for the study of electronic excitations in condensed matters. Dr. Kao joined the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory (BNL) in 1988 after he received his Ph. D. Currently, he is the associate chairman for user science at the NSLS, and is actively involved in the BNL Center for Functional Nanomaterials (CFN). Dr. Kao is a member of the American Physical Society and American Association for the Advancement of Science. He has published over 100 refereed papers, chaired and organized many synchrotron radiation related workshops and meetings, and served on many national and international advisory committees.

Conference Program Chairs

Howard H. Chen

IBM Research Division
Thomas J. Watson Research Center
Yorktown Heights, New York, U.S.A.

BIOGRAPHY

Dr. Howard Chen received his Ph.D. degree from the University of California, Berkeley, in 1987. Since then, he has been with the IBM Research Division, Thomas J. Watson Research Center, in Yorktown Heights, New York, where he is current a research staff member. Dr. Chen has received the IBM Invention Achievement Award for 7 U.S. patents, the IBM Research Division Award for contributions to the design and realization of the Alliance G4 microprocessor, the IBM Outstanding Contribution Award for the design and realization of the Alliance G5 microprocessor, and the IBM Research Division Award for the design and implementation of Freeway G7 microprocessor.

Conference Program Chairs

Sue-Jane Wang

The Statistics Representative
FDA Inter-Center Pharmacogenomics/ Pharmacogenetics Working Group
U.S. Food and Drug Administration
Email: wangs@cder.fda.gov

Adjunct Professor, Johns Hopkins University, Part-Time Engineering School, Maryland

BIOGRAPHY

Sue-Jane Wang has been serving as the Statistics Representative of FDA inter-center (Center for Drug Evaluation and Research, Center for Device and Radiological Health, Center for Biologics Evaluation and Research and National Center for Toxicology Research) Pharmacogenomics/ Pharmacogenetics (PG) Working Group. Her roles are twofold. One is to provide specific leadership in discussing statistical concepts/ issues of pharmacogenomics/ pharmacogenetics study design and data analysis in the multi-disciplinary expert environment. A main objective of the PG Working Group was to draft a guidance for industry on Pharmacogenetics and Pharmacogenomics: Clinical Studies and *In Vitro* Diagnostic Tests in Marketing Applications for Human Drug Products and Biologicals. The statistical consideration section of this draft guidance for industry has incorporated general principles in the statistical review of gene expression studies and genome scan DNA studies in the context of nonclinical experiments and clinical trials. As a member of the PG Working Group, Dr. Wang is currently involved in planning the second PG workshop on "Pharmacogenomics in Drug Development and Regulatory Decision-Making: The Genomic Data Submission (GDS) Proposal." The intent of the workshop is to provide a forum for more detailed discussion of the Agency's proposal and issues related to defining voluntary submission of PG data from pharmaceutical drug/ biologics/ device sponsors, the format and process for presenting such data, and the procedure for regulatory review.

She received her master degree from University of California, Los Angeles, CA and Ph.D. from University of Southern California. Dr. Wang's major research and application activities include controlled clinical trials; genetic and epidemiologic studies; statistical methods for analysis of microarray data and pharmacogenomics/ pharmacogenetics data in drug development; and teaching in biostatistics. Her professional activities include Editor-in-Chief: International Chinese Statistical Association (ICSA) Bulletin; Section Editor: Controversial Statistical Issues; Member: the Board of Directors, Publication committee and Award committee of ICSA; Chair: statistics sessions and biotechnology sessions in conferences, symposium, workshops including Pharmacogenomics Session and Genomics in Drug Discovery and Development Session at the FDA/ Industry workshop, Statistics in Genetic Epidemiology at the ICSA applied statistics symposium, Bio-Chip Technology and Data Mining session at the Symposium on Biomedical Technology Development, etc. 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 Program Chairs

Darrin J. Young

Case Western Reserve University

BIOGRAPHY

Darrin J. Young received his BS, 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 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 main research interests include MEMS device design and fabrication, and integrated analog circuits design for wireless communications, sensing, biomedical implant, and general industrial applications.

Conference Program Chairs

Dr. Rong Chang

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BIOGRAPHY

Dr. Rong Chang is Manager of Network Hosted Application Services 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 Utility 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, hypermedia information management, and personal pervasive computing and communication.

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 1982 to 1984 he served in the Chinese Army Communications School, Taiwan, as an R&D staff and a lecturer in computer science. 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 engineering honor society and Eta Kappa Nu electronical engineering honor society. He is a member of ACM, IEEE, and Chinese Institute of Engineers---USA.

Conference Coordinators

Fei Sun

Electrical Engineering Department
Princeton University

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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 codesign.

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.

Day1

Keynote Speech

Chintay Shih

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ABSTRACT

The IT industry in Taiwan is confronted with the challenges of declining profit margin, increasing competition from Mainland China, shortage of engineers and lack of own brand name. Meanwhile, we also find some opportunities from the development trend of the industrial globalization. Under the cost down pressure, the US industries gradually increase outsourcing for engineering and design. The entry to the WTO of the Cross-straits means to open the domestic market of Mainland China will create business opportunities to Taiwan industries. To enhance product value added and strength competitiveness, the government of Taiwan sets plans to establish innovation and R&D centers in "the National Development Plan-Challenge 2008" to promote key technology research programs in biotech, nanotech, chip-system technology, and broadband & wireless communication.

To conclude, we can see IT industry has built solid foundation in Taiwan after decades' development. At this moment, under the driving force of industry globalization, Taiwan IT industry is transiting from OEM oriented to value added products manufacturing and system application focusing on knowledge-based service. How to deploy current resources and advantages in IT industry to continue the innovation in technology and to strengthen competitiveness is the most important issue to the future industry development in Taiwan.

BIOGRAPHY

Education:

Ph.D.	Electrical Engineering , Princeton University	1975
M.S.	Management, Stanford University	1985
B.S.	Electrical Engineering, National Taiwan Univ.	1968

Experience:

President of ITRI	1994～2003
Vice President of ITRI	1989～1994
VP & General Director of ERSO/ ITRI	1984～1989
Engineer Manager, Plant Manager of IC Center, Deputy General Director of ERSO/ ITRI	1976～1984
Senior Engineer, Burroughts, USA	1974～1976

Current Position

Special Advisor of ITRI 2003

Recent advisory positions:

Science &Technology Advisor of the Executive Yuan since 1998

Chairman of the Asia Pacific Intellectural Property Association since 1997

President of Chinese Business Incubation Association since 2003

P1 - Plenary Session 1: Nanotechnology

Session Chair

Dr. Chi-Chang Kao

Senior Scientist
Brookhaven National Laboratory

BIOGRAPHY

Education

Ph.D., Cornell University, Ithaca, N.Y., 1988

Experience

Dr. Kao's research interest has been in the development of new experimental techniques using synchrotron radiation, and their applications to condensed matter physics and material science. In particular, he has been working on the development of soft-x-ray resonant magnetic scattering for magnetism and magnetic material research, and high-resolution inelastic x-ray scattering for the study of electronic excitations in condensed matters. Dr. Kao joined the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory (BNL) in 1988 after he received his Ph. D. Currently, he is the associate chairman for user science at the NSLS, and is actively involved in the BNL Center for Functional Nanomaterials (CFN). Dr. Kao is a member of the American Physical Society and American Association for the Advancement of Science. He has published over 100 refereed papers, chaired and organized many synchrotron radiation related workshops and meetings, and served on many national and international advisory committees.

P1 - Plenary Session 1: Nanotechnology

High Temperature Operation (~240 K) of InAs/GaAs and Silicon-Germanium Quantum Dot Infrared photodetectors (QDIP)

Si-Chen Lee

Department of Electrical Engineering and Graduate Institute of Electronic Engineering,
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ABSTRACT

There are two different classes of techniques to produce nanoparticles. One is 'top-down' technique and the other is 'bottom-up' process. The 'top-down' approach produce nanoparticles from planar growth and fabrication techniques including e-beam lithography, pattern-dependent oxidation (PADOX) method, molecular beam epitaxy (MBE) and so on. The 'bottom-up' approach synthesizes nanoparticles from constituent atoms including chemical precipitation , sol-jel process, thermal evaporation , chemical vapor deposition (CVD), laser ablation, sputtering and so on. In this paper, we use either top-down MBE to fabricate InAs/GaAs quantum dot infrared photodetector (QDIP), or combined the bottom-up, i.e., the thermal evaporation method, and the MBE to fabricate spherical silicon germanium (SiGe) QDIPs.

The growth mechanism of InAs self-assembly quantum dots on (001) GaAs by MBE had been studied in detailed. It was found that the growth mode changes abruptly when the deposition temperature increases from 490°C to 510°C, *i.e*, the dot size is uniformly distributed at 490°C, but switches to two distinctly different sized groups at 510°C. A new growth mechanism is proposed to explain this phenomenon. If an InGaAs cap layer is deposited on InAs QDs before the deposition of GaAs barrier layer, the stress induced phase separation growth of InAs (on InAs QD) and GaAs (on InAs wetting layer between QDs) layers was observed. The phase separation growth leads to high quality InAs QDs with thicker vertical size.

The 10 stacked self-assembled InAs/GaAs quantum dot infrared photodetector operated in 2.5 to 7 □m range by photovoltaic and photoconductive mixed-mode near room temperature (≧250 K) was demonstrated. The specific peak detectivity D* is 2.4 $\times 10^8$ cm-Hz$^{1/2}$/W at 250 K. The use of high-bandgap $Al_{0.3}Ga_{0.7}As$ barriers at both sides of the InAs quantum dot structure and the long carrier recombination time are the key factors responsible for its near-room-temperature operation.

A 600 nm boron doped Si(10^{19}/cm^3) and then 300 nm undoped Si layer was grown sequentially on Si substrate at 600 ℃ by MBE. SiGe alloy quantum dots were deposited on these samples by thermal evaporation method. After SiGe dots were deposited, this device was treated by methanol. An undoped layer and boron doped Si layer(10^{19}/cm^3) were then grown by MBE at respective 400 ℃ and 550 ℃ on top of SiGe dots. The peak responsivity of the SiGe/Si QDIP is 4.2 mA/W at a wavelength region from 1 to 3.5 μm which is stronger than the peak responsivity of 0.67 mA/W in the region from 13 to 20 μm. The high specific detectivity (D*) achieved is 5.0 x 10^{10} cm-Hz$^{1/2}$/W under zero bias. This QDIP is capable of operating up to at 240 K with a good performance.

BIOGRAPHY

Si-Chen Lee (李嗣涔) was born in Taiwan, on August 13, 1952. He received the B.S. degree in electrical engineering from National Taiwan Universityin 1974 and Ph.D degree in electrical engineering from Stanford Universityin 1980 with a work consisting of experimental investigation of the AlGaAs/ GaAs multi-heterojunction properties.

From 1980 to 1982, he worked at Energy Conversion Devices Inc. concerning the application of amorphous silicon hydrogen alloy to the solar cells. He joined the Department of Electrical Engineering, National Taiwan University in 1982 as a visiting associate professor, and is a professor now.

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. Since 1988, he pioneered a research work on the Chinese traditional qigong and somatic science which confirmed the existence of certain extraordinary ability of human body, such as character recognition by finger, psychokinesis. He also discovered the existence of information field (spiritual world) and proposed the "unification of mind and matter" to explain the phenomena.

Dr. Lee is an IEEE Fellow, member of the Chinese Institute of Electrical Engineering, he has received Dr. Sun Yat-San Academic award in 1987, five consecutive outstanding research awards of National Science Council from 1986 to 1996. He has been elected as a member of The Asia-Pacific Academy of Materials (APAM) in 1997, and received IEEE Third Millennium Medal for outstanding achievements and contributions in the area of Semiconductor Devices in 2000. In 2002, he was awarded the Medal of Electrical Engineering from the Association of Chinese Electrical Engineer.

P1 - Plenary Session 1: Nanotechnology

DOE's Nanoscale Science Research Centers

Robert Hwang

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ABSTRACT

As part of the National Nanotechnology Initiative, the Office of Basic Energy Sciences is constructing 5 Nanoscale Science Research Centers. In this presentation, I will describe the mission of these centers and how the scientific community can interact with them.

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.

P2 - Plenary Session 2: MEMS

Session Chair

Darrin J. Young

Case Western Reserve University

BIOGRAPHY

Darrin J. Young received his BS, 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 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 main research interests include MEMS device design and fabrication, and integrated analog circuits design for wireless communications, sensing, biomedical implant, and general industrial applications.

P2 - Plenary Session 2: MEMS

Nano- and Microscale BioPOEMS*

Luke P. Lee

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ABSTRACT

The BioPOEMS interfaces biological molecules or biopolymers with nanoscale probes and biophotonic microsystems. The BioPOEMS allow to create a new paradigm of large-scale hybrid integration of optical, electrical, and microfluidic devices. The BioPOEMS can be exploited in genomic/proteomic chips, point-of-care diagnostic biochips, lab-on-a-chip, or advanced implantable devices. As examples of *microscale BioPOEMS*, micro-confocal imaging array system (CIAs), disposable self-aligned integrated microfluidic optical systems (SiMOS), and microarrays of total internal reflection fluorescent microscopy (TIRFM) on-a-chip are developed for high-throughput-screening of cellular pathway monitoring. For *nanoscale BioPOEMS*, nanofluidic Surface-Enhanced Raman Spectroscopy (*n*SERS) are being developed for single biomolecular detection biochip and direct DNA sequencing. Batch fabrication of plasmon-based nanophotonic devices on transparent substrate with integrated nanocavity junctions is accomplished for compact and ultrasensitive biophotonic nanosystems. In this talk I will review the challenges and achievements in the hybrid integration of nanophotonics and the BioPOEMS for compact, ultrasensitive, and autonomous systems.

*BioPOEMS (Bio-Polymer-Opto-Electro-Microfluidic-System)

BIOGRAPHY

Prof. Luke P. Lee is an Assistant Professor in the Department of Bioengineering at UC Berkeley, Co-Director of Berkeley Sensor and Actuator Center, and Director of Bionanotechnology Center. He received both his B.A. in Biophysics and Ph.D. in Applied Science & Technology (major: Applied Physics & minor: Bioengineering) from UC Berkeley. His current research topics are nano- and microscale biophotonic devices, BioMEMS, DNA nanoelectronics, and molecular biophysics.

P2 - Plenary Session 2: MEMS

Integration of a Microsystem for Chemical and Biological Sensing

Chung-Chiun Liu

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ABSTRACT

A microsystem for the monitoring of a chemical or biological environment requires (1) multiple sensors or an array of sensing elements (2) an interface for the transmission of the sensor outputs to the external environment and (3) a supporting energy source for the operation of the sensors and the interface. Integration of these elements into a complete microsystem is the objective of this research. Platform technology for various sensor arrays will be introduced. A wireless multi-channel telemetric interface used in this research will be discussed. Miniature electrochemical energy sources, including a micro-fuel cell, portable zinc-alkaline and zinc-air batteries are used as the supporting energy sources.

Silicon-based microfabrication and micromachining processes are the underpinning technical approaches in the development of the elements and the integration of the microsystem.

BIOGRAPHY

Chung-Chiun Liu is the Wallace R. Persons Professor of Sensor Technology and Control and a Professor of Chemical Engineering at Case Western Reserve University. He is also the Director of the Electronics Design Center, a multi-disciplinary research and educational Center focusing on the applications of microfabrication technology to the development of chemical and biological microsystems. His research interest includes microfabrication processing, chemical and biological sensors, and electrochemical energy systems

T1 - Technical Session 1: Nanotechnology (I)

Session Chair

Si-Chen Lee

National Taiwan University

BIOGRAPHY

Si-Chen Lee (李嗣涔) was born in Taiwan, on August 13, 1952. He received the B.S. degree in electrical engineering from National Taiwan University in 1974 and Ph.D degree in electrical engineering from Stanford Universityin 1980 with a work consisting of experimental investigation of the AlGaAs/ GaAs multi-heterojunction properties.

From 1980 to 1982, he worked at Energy Conversion Devices Inc. concerning the application of amorphous silicon hydrogen alloy to the solar cells. He joined the Department of Electrical Engineering, National Taiwan University in 1982 as a visiting associate professor, and is a professor now.

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. Since 1988, he pioneered a research work on the Chinese traditional qigong and somatic science which confirmed the existence of certain extraordinary ability of human body, such as character recognition by finger, psychokinesis. He also discovered the existence of information field (spiritual world) and proposed the "unification of mind and matter" to explain the phenomena.

Dr. Lee is an IEEE Fellow, member of the Chinese Institute of Electrical Engineering, he has received Dr. Sun Yat-San Academic award in 1987, five consecutive outstanding research awards of National Science Council from 1986 to 1996. He has been elected as a member of The Asia-Pacific Academy of Materials (APAM) in 1997, and received IEEE Third Millennium Medal for outstanding achievements and contributions in the area of Semiconductor Devices in 2000. In 2002, he was awarded the Medal of Electrical Engineering from the Association of Chinese Electrical Engineer.

T1 - Technical Session 1: Nanotechnology (I)

Session Chair

Howard Lee

NanoOpto

BIOGRAPHY

HOWARD LEE is currently a management consultant, board member and investor in high-tech companies. He co-founded NanoOpto, a startup that uses Nanotechnolgy to fabricate passive integrated optical devices. He was the founding CEO of NanoOpto and now serves as a board member. Previous startups include being the interim CEO and board member of Equator Technology, a media processor startup in Silicon Valley and the President of Rise Technology, an Intel x86 compatible microprocessor startup company.

At Sun Microsystems from 1984 to 1994, he was a vice president of engineering responsible for the engineering and delivery of all Sun-2 and Sun-3 workstation and server products. He delivered the Sun-4 Sever product family and was in charge of unifying and delivery of all SPARC microprocessor development programs.

Lee was the senior vice president of the Apple Macintosh Division responsible for the entire range of computer hardware and peripheral products with annual sales of $9 Billion and unit volume of 6 million Macs. These included Macintosh desktop, PowerBook, server, printer, and display products. His industry experience also includes positions at GRID Systems, where he was manager for Hardware Engineering, and management posts at Hewlett-Packard in its Personal Office Computer Division and Hewlett-Packard Labs.

Lee holds a bachelor's degree in electrical engineering from Cornell University, a master of engineering degree in electrical engineering, and computer science from the University of California, Berkeley, and a master's of business administration from the University of Santa Clara.

T1 - Technical Session 1: Nanotechnology (I)

Towards Enabling Materials Design for Low-Cost Plastic Transistors

Beng Ong

Fellow, Xerox Innovation Group, Xerox Corporation
Manager, Xerox Research Centre of Canada.

ABSTRACT

Silicon integrated circuits (ICs) are wonderful for high-end microelectronics, but they may be unjustifiably or prohibitively costly for large-area devices (e.g., displays) where high switching speeds are not required.

Organic or plastic thin film transistors (TFTs) aim to address the high cost issue of ICs by moving the manufacturing from the capital-intensive, high temperature, high vacuum complex photolithographic ultra-clean room setup to a less-controlled environment using solution-based fabrication technologies. To enable this transition, molecularly engineered organics, which are solution processable and are capable of self-organization into proper microstructures to provide functionality, are required. Printed ICs composed of plastic transistors are expected to be low cost, and enable compact, lightweight, and flexible device designs, thus ushering in a new generation of structurally inspiring electronic products. The issues, challenges and advances in materials design for this emerging technology will be presented. Our progress in developing semiconductor polymers with sufficient air stability to enable fabrication of high-performance plastic transistors under ambient conditions will be described.

BIOGRAPHY

Beng Ong received his undergraduate education in Singapore, and completed his Ph.D. study at McGill University, Canada. He joined Xerox Research Centre of Canada in 1978 after spending two years as a Research Fellow at Harvard University, Cambridge, MA. At Xerox, Ong's research has been wide ranging, from electronic materials for photoreceptors, specialty chemicals for toners and inks to security authenticity taggants, novel display concepts/ materials, and printed organic electronics. Beng was the key contributor to Xerox's recently announced breakthrough EA toner technology, developing and nurturing this novel chemical toner concept from infancy to maturity before switching to spear-heading Xerox 21st-century materials initiative in 2000. He holds some 115 U.S. patents in his credit, and is currently a Fellow of Xerox Innovation Group, Xerox Corporation, and Manager of Printed Organic Electronics Research, Xerox Research Centre of Canada.

T1 - Technical Session 1: Nanotechnology (I)

Magnetic nanoparticle arrays for information technology applications

Shouheng Sun

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ABSTRACT

Ordered arrays of magnetic nanoparticles are promising candidates for future information technology applications. In this talk, I will demonstrate that monodisperse magnetic nanoparticles including cobalt (Co), magnetite (Fe_3O_4), and iron-platinum (FePt) nanoparticles, with controlled size, composition and structure can be readily synthesized by chemical methods, and subsequently induced to form 2-D and 3-D magnetic nanoparticle superlattice arrays via self-assembly. The interparticle spacing in the array can be adjusted by either surface chemical ligand exchange or thermal treatment. Magnetic properties of these arrays can be tuned from superparamagnetic to ferromagnetic with controlled magnetic moment. Further, the hydrophobic surfactant layer around each nanoparticle can be replaced with bipolar surfactants, rendering the particles hydrophilic and able to be dispersed in water. These well-engineered magnetic nanostructures are of great interest for deep understanding of nanomagnetism and will have great potential in magnetic nanodevice and bio-magnetic applications. Several examples of the potential applications of these self-assembled nanostructures in information data storage, tunnelling devices and permanent magnet will be discussed.

BIOGRAPHY

Shouheng Sun is currently a research staff member in the Physical Sciences Department at the IBM T. J. Watson Research Center. His current research interest focus on controlled synthesis of transition-meal-based nanomaterials and self-assembly of monodisperse magnetic nanoparticles into functional nanodevices.

Shouheng Sun holds a BS degree from Sichuan University (China), an MS degree from Nanjing University (China) and a PhD degree from Brown University (all in chemistry). He was an assistant professor and a lecturer in the Department of Chemistry and the Coordination Chemistry Institute of Nanjing University from 1987 to 1992. He joined IBM Research Division after completing his doctoral studies in 1996.

T1 - Technical Session 1: Nanotechnology (I)

Nanoscale Functionalization Strategies

Sarbajit Banerjee and Stanislaus S. Wong*

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ABSTRACT

Whereas the chemistry of fullerenes is well-established, the chemistry of single-walled carbon nanotubes (SWNTs) is a relatively unexplored field of research. Investigations into the bonding of moieties onto SWNTs are important because they provide fundamental structural insight into how nanoscale interactions occur. Hence, understanding SWNT chemistry becomes critical to rational, predictive manipulation of their properties.

Among the strategies discussed include molecular metal complexation with SWNTs to control site-selective chemistry in these systems. In particular, work has been performed using Vaska's and Wilkinson's complexes to create functionalized adducts. Functionalization should offer a relatively simple means of tube solubilization and bundle exfoliation and allows for tubes to be utilized as recoverable catalyst supports.

To further demonstrate chemical processability of SWNTs, we have subjected them to ozonolysis, followed by treatment with various independent reagents, to rationally generate a higher proportion of oxygenated functional groups on the nanotube surface. This protocol has been found to purify nanotubes. More importantly, the reaction sequence has been found to ozonize the sidewalls of these nanotubes.

Finally, SWNTs have also been chemically modified with quantum dots and oxide nanocrystals. A composite heterostructure consisting of nanotubes joined to nanocrystals offers a unique opportunity to obtain desired physical, electronic, and chemical properties by adjusting synthetic conditions to tailor the size and structure of the individual sub-components, with implications for self-assembly.

BIOGRAPHY

Professor Stanislaus S. Wong and his group have wide-ranging interests in the science of nanotechnology. In a broad sense, his group is fundamentally interested in synthesizing, manipulating, and organizing matter in a controllable manner as well as in predicting and understanding the properties of the resulting structure at the nanometer scale. To accomplish this objective, they are investigating the chemistry of and the types of bonding in nanomaterials, such as carbon nanotubes. Some of Dr. Wong's and coworkers' results have been featured in a cover article in *Nature* (1998) and in an invited Concepts article in Chemistry: a European Journal (2003). Dr. Wong earned a B.Sc. (First Class Honors) from McGill University, received his A.M. (1996) and Ph.D. (1999) degrees from Harvard University (advisor: Charles M. Lieber), and completed a postdoctoral fellowship at Columbia University (mentor: Louis E. Brus). Since September 2000, he has been an Assistant Professor in Chemistry at the State University of New York (SUNY) Stony Brook with a joint appointment in the Materials Sciences Department at Brookhaven National Laboratory.

T2 - Technical Session 2: MEMS (I)

Session Chair

Luke P. Lee

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BIOGRAPHY

Prof. Luke P. Lee is an Assistant Professor in the Department of Bioengineering at UC Berkeley, Co-Director of Berkeley Sensor and Actuator Center, and Director of Bionanotechnology Center. He received both his B.A. in Biophysics and Ph.D. in Applied Science & Technology (major: Applied Physics & minor: Bioengineering) from UC Berkeley. His current research topics are nano- and microscale biophotonic devices, BioMEMS, DNA nanoelectronics, and molecular biophysics.

T2 - Technical Session 2: MEMS (I)

Integration of MEMS and Planar Waveguide Technologies for Lightwave Switching

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ABSTRACT

Planar waveguide circuits are widely used in telecommunication networks to perform a variety of optical functions such as multiplexing, switching and add-drop. In these devices, switching and reconfiguration are typically achieved using the thermo-optic effect. The power consumption, thermal cross-talk and switching time of thermo–optic switches can impose limits on device performance. We demonstrate the integration of planar waveguides and microelectromechanical systems (MEMS). Our device consists of a folded Mach Zehnder interferometer in the waveguide part and movable piston mirrors in the MEMS part. The MEMS mirrors are actuated electrostatically. They provide an adjustable phase shift in the Mach Zehnder interferometer to perform the switching function, with negligible dissipation of power. The insertion loss and extinction ratio of the device range from 13.1 to 14.7 dB and 11 to 21.5 dB respectively. This technique is applicable to other waveguide devices where phase manipulation with low power consumption is desired.

BIOGRAPHY

Ho Bun Chan is a member of technical staff in the Microsystems Research Department of Bell Labs, Lucent Technologies in Murray Hill, NJ. He earned his BA degree in physics with highest honors from Princeton University in 1993 and PhD degree in physics from MIT in 1999. He joined Bell labs in 1999 as a postdoctoral staff. Dr. Chan's research focuses on microelectromechanical systems (MEMS) in fundamental science and telecommunication networks. He performed the first demonstration of quantum mechanical Casimir forces in MEMS, in the regime when separation between micromachined components is reduced to the nanometer range. He is currently performing research in integrating MEMS with planar waveguides for enhanced functionality and performance in multi-wavelength optical networks. He was also involved in the development and fabrication of MEMS optical crossconnect for light beam steering in optical communication networks.

T2 - Technical Session 2: MEMS (I)

A Micromachined Touch-Mode Tunable Capacitor for Wireless Communications

Darrin J. Young

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ABSTRACT

A micromachined touch-mode tunable capacitor is proposed for wireless communication applications. The touch-mode architecture substantially minimizes the device area and microphonic effects. A fabricated device achieves a nominal capacitance value of 1.86 pF with a tuning range of 25% under 5V and a quality factor of 22 at 1 GHz and occupies a circular area with a 140 μm radius.

BIOGRAPHY

Darrin J. Young received his BS, 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 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 main research interests include MEMS device design and fabrication, and integrated analog circuits design for wireless communications, sensing, biomedical implant, and general industrial applications.

T2 - Technical Session 2: MEMS (I)

Development of High Fill-factor Micromirror Scanners for Adaptive Optics

Dr. Veljko Milanovic, Gabe Matus, Dr. Daniel McCormick

Adriatic Research Institute

ABSTRACT

A micromachined touch-mode tunable capacitor is proposed for wireless communication applications. The touch-mode architecture substantially minimizes the device area and microphonic effects. A fabricated device achieves a nominal capacitance value of 1.86 pF with a tuning range of 25% under 5V and a quality factor of 22 at 1 GHz and occupies a circular area with a 140 μm radius.

BIOGRAPHY

Dr. Veljko Milanovic - (M.Sc. and D.Sc. in Electrical Engineering - Microelectronics in 1996 and 1998, The George Washington University, Washington, DC) founded Adriatic Research Institute with a focus on microsystems and nanosystems research and education for public benefit. He is also currently involved in biomolecular sciences research in the Nanoengineering Laboratory at the Mechanical Engineering Department of UC Berkeley. Formerly a post-doctoral researcher at the Berkeley Sensor and Actuator Center, and a guest researcher in the Semiconductor Electronics Division of the National Institute of Standards and Technology, Veljko has been involved in MEMS and nanotechnology research and development efforts for close to ten years.

T3 - Technical Session 3: System-on-Chip (SoC) (I)

Session Chair

Wei Hwang

National Chiao-Tung University

BIOGRAPHY

Dr. Wei Hwang is the Director of Microelectronic and Information Systems Research Center and holds the NCTU Chair Professor of Electronics Engineering at National Chiao-Tung University in Hsinchu, Taiwan since August 2002. He is also the Director of System-on-Chip (SoC) Research Center at NCTU. Prior to this, he was a Research Staff Member at the IBM Thomas J. Watson Research Center, Yorktown Heights, NY from 1984 to 2002. He also served as an Adjunct Professor of Electrical Engineering at Columbia University in New York, NY from 1993 to 2003. He was Associate Professor of Electrical Engineering Department at Columbia University in New York from 1979 to 1984. He was Assistant Professor of Electrical Engineering at Concordia University in Montreal from 1975 to 1978. He received his M.S. and Ph.D. degrees from the University of Manitoba in 1970 and 1974 respectively, his M.S. degree from National Chiao-Tung University in 1967, and his B.S. degree from National Cheng-Kung University in 1964. Dr. Hwang's interests are in the general area of VLSI circuits and technology, semiconductor memories, high-frequency server microprocessors, and embedded systems.

His current research interests are in low-power SoC design and technology, wireless mobile communications and applications. He has received several IBM Awards, including sixteen IBM Invention Plateau Invention Achievement Awards, four IBM Research Division Technical Awards, has been elected an IBM Master Inventor. Dr. Hwang is the coauthor of the book "Electrical Transports in Solids", which has been translated into Russian and Chinese. He has authored or coauthored over 110 technical papers in journals and conferences, and holds 122 international patents (including 55 U.S. patents).

Dr. Hwang is a member of the New York Academy of Science, Phi Tau Phi and Sigma Xi. He is also an active member of the Chinese American Academic and Professional Society (CAAPS) where he has served separately as President and Chairman of the Board. For his leadership, he received Courvoisier Leadership Award in 1992 and the CAAPS Special Service Award in 1995. Currently, he serves as Co-Principal Investigator of National System-on-Chip (SoC) Research Program of National Science Council in Taiwan. Dr. Hwang is the Chairman of IC industry committee of Chinese Institute of Electrical Engineering (CIEE) and a Fellow of the Institute of Electrical and Electronics Engineers (IEEE)

T3 - Technical Session 3: System-on-Chip (SoC) (I)

Some Challenges for Low-Power System-On-a-Chip

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ABSTRACT

New Process technologies enable IC devices of extreme sizes and complexity. System-On-a-Chip (SoC) designs incorporate whole system on a single chip. Yet as complexity increase, innovative solutions are required to conserve power. Recently, the dynamic choices of power management have been studied, because non-uniform workloads during the operation time are common in communication networks and in almost any interactive system. Since each core or macro of the embedded systems may come with different power and performance characteristics from a different source, however, designing a SoC that supports dynamic power management is difficult and error-prone process.

In this talk, first of all, we'll investigate key dynamic power management techniques, in terms of high-performance and low-power SoC design. It includes dynamic supply voltage and frequency scaling, active-well bias, power gating, clock gating, and multiple voltage islands. Then, we'll present some other novel techniques such as self-bias power gating structure and non-abrupt sleep transistor switching.

BIOGRAPHY

Suhwan Kim received the B.S. and M.S. degrees in Electrical Engineering and Computer Science from Korea University, Korea, in 1990 and 1992, respectively and the Ph.D. degree in Electrical Engineering and Computer Science from the University of Michigan, Ann Arbor, in 2001. From 1993 to 1997, Dr. Kim was with LG Electronics, Seoul Korea, where he designed several multimedia systems-on-a-chip (SoC), including an MPEG2 CODEC for audio, video, and system. Dr. Kim joined IBM Thomas J. Watson Research Center in 2001, where he currently is a Research Staff Member (RSM). His research interests encompass circuits and technology for high-performance and low-power SoC and low-power design methodologies for high-performance VLSI signal processing. Dr. Kim has received the 1991 Best Student Paper Award of the IEEE Korea Section and the First Prize in the VLSI Design Contest of the 2001 ACM/ IEEE Design Automation Conference. Dr. Kim has also received several of achievement awards from LG Electronics and IBM. He has participated in the Organizing Committee and Technical Program Committee of the IEEE International ASIC/ SOC Conference and in the Technical Committee of the International Symposium on Low Power Electronics and Designs.

T3 - Technical Session 3: System-on-Chip (SoC) (I)

Power Management for nano-CMOS System-on-Chip Designs: the Problem, the Trend, and the Solution

Herming Chiueh and Wei Hwang

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ABSTRACT

Increases in circuit density and clock speed in modern system-on-chip (SoC) designs have brought power issues into the spotlight of high-speed integrated circuit design. Local overheating in one spot of a high-density circuit can cause a whole system to crash. Clock synchronization problems, parameter mismatching and other coefficient changes due to temperature gradients generated by high power density and uneven heat-up of a chip are one of the major reasons for system failure. With the increasing size of integrated circuitry, the total power of a typical SoC design increase dramatically, that escalates the problem and system cost by introducing a complicated design in package and system integration. On the other hand, a modern mobile device tends to integrated heterogeneous functional blocks into a chip: different IP cores have been integrated in a platform-based SoC design flow to provide more functions. However, the battery power of such a device is often limited. Thus, power management has become a key design issue in the modern low power and/or high performance SoC designs.

Power and thermal problems in modern SoC designs are reviewed in the beginning of this paper. Then, the trends of both academia and industry solution are reviewed. At last, a thermal-aware power management is presented to manage the power and local heat-up on modern SoC designs. The proposed design targets nominal power dissipation and requires the system to actively manage its power and thermal activities. The architecture will be encapsulated to an IP (Intellectual Property) module or a virtual component of the modern system-on-chip design flow, which yields a systematic solution crossing the application/system/circuit/device layers that will link up the architecture and cell circuitry design as well as the modern nano-CMOS technology such as voltage islands and multi-threshold transistors to provide a complete solution for SoC power management.

System architects can utilize this design to monitor power activities and react to specific conditions through the controlling mechanism, such as cooling mechanism and state-machine based voltage/speed/power modulation for different modules of an IP or a system, to ensure the power operation and thermal behavior of an SoC design working within specification. By the delicate power/speed controlling of different modules on an SoC system, this design not only nominates the overall power consumption, but also maximizes the performance of target system in designed power budget.

The success of this project offers an opportunity for modern SoC designs to incorporate power management techniques to enhance system stability and performance. This design yields intricate control and optimal management with little system overhead and minimum hardware requirements, as well as provides the flexibility to support different management algorithms.

Keywords: System-on-chip, VLSI, thermal management, power management, intellectual property

* This research is supported by National Science Council grant NSC-92-2218-E009-014.

BIOGRAPHY

Dr. Herming Chiueh received his B.S. degree from the Department of Electrophysics, National Chiao Tung University, Hsin-Chu, Taiwan in 1992, and the M.S. and Ph.D. degrees from Department of Electrical Engineering, University of Southern California, Los Angeles, U.S. in 1994 and 2002. From 1996-2002, he was with Information Sciences Institute, University of Southern California, Marina del Rey, California, U.S. He is currently an Assistant Professor, Department of Communication Engineering, School of Electrical Engineering and Computer Science, National Chiao Tung University, Hsin-Chu, Taiwan. His research interests include system-on-chip design methodology, thermal management for VLSI, and power-aware integrated circuits.

T3 - Technical Session 3: System-on-Chip (SoC) (I)

CoMoC (Communication on a Chip): A Systematic Approach to Solve On-Chip Global Communication Problem in SoC

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ABSTRACT

Continuing shrinkage of feature size and ever-increasing SoC design complexity present great challenges to design high-reliability, high throughput on-chip interconnection circuitry. Design uncertainties rise sharply due to coupling noises, process variations, and power delivery fluctuations, among many other factors demand resource-hungry stopgap measures, such as shielding, buffer insertion, sizing, spacing, and extended timing margins. These remedies, while temporarily meeting today's demand, do not offer a comprehensive, long term solution to the many on-chip communication problems faced by the next generation integrated circuit. These communication channel impairment not only impose unacceptable limits on attainable throughput, but also seriously compromise the reliability of the on-chip data communication.

To explore comprehensive, long-term solutions for SoC on-chip communication systems, we envision a heterogeneous, multiple-tiered on-chip inter-communication system that facilitates high performance (high throughput, low delay, high reliability), cost effective (low power consumption, low area demand) communication services to on-chip IPs. Specifically, we believe that the on-chip inter-connection communication problem must be solved as a communication system development problem. By taking a system design approach, we will explore a comprehensive solution space, encompassing theory, algorithm and protocols, CAD tools, architecture. A preliminary exploratory study of a wave-pipelined global interconnection methods will also be reported.

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 180 technical papers in these areas.

Dr. Hu is a fellow of IEEE. He is a former associate editor (1988-1990) for the IEEE Transaction of Acoustic, Speech, and Signal Processing in the areas of system identification and fast algorithms. He is currently associate editor of IEEE Signal Processing letters (2002-

2003), Journal of VLSI Signal Processing, and European Journal of Applied 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 is a former 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 Internation conference of Multimedia and Expo on behalf of IEEE Signal processing society.

T3 - Technical Session 3: System-on-Chip (SoC) (I)

Si-Based RF SoC/ SoP For Wireless Communication

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ABSTRACT

Silicon-based platform is provided as the candidate for the integration solution of wireless communication systems. The trend for System-on-Chip (SoC), including co-design and fabrication of digital and analog parts of an entire system, calls for technology development on RF-SoC. As the intention is facing un-resolvable challenging issues, such as low performance passive components and power deficient amplifier fabricated by standard CMOS process, an intermediate approach is RF-SoC/ SiP technology, which applies Low-Temperature Cofired-Ceramics (LTCC) substrate as an integration carrier with embedded high-performance passives. While LTCC offers relief to those RF-SoC issues, silicon-based carrier is still preferred as far as system integration of multi-functional and high-performance baseband digital circuitry is concerned. This approach, therefore, is aimed at the development of integration technology and circuit for wireless transceiver design as highly integrated high-performance modules, consisting of active devices, passive components and chip sets, in the technology of silicon-based RF-SoC/ SoP.

Keywords: System-on-Chip, System-on-Package, high Q-factor.

* This research is supported by National Science Council grant NSC-92-2220-E-009-005.

BIOGRAPHY

Chien-Nan Kuo received the B. S. degree in electronic engineering from National Chiao-Tung University, Hsin Chu, Taiwan, in 1988, the M. S. degree in electrical engineering from National Taiwan University, Taipei, Taiwan, in 1990, and the Ph. D. degree in electrical engineering from the University of California, Los Angeles (UCLA) in 1997. He was with the mobile system division, ADC Telecommunications as a member of the technical staff in Aug., 1997. He joined the Communication Research and Design Center, IBM, for development of RF systems applicable to WCDMA and CDMA2000 wireless communications in 2000. He is currently an Assistant Professor, Department of Electronics Engineering, National Chiao Tung University, Hsin-Chu, Taiwan. His research interests include design and characterization of RF and microwave and millimeter-wave integrated circuits, the simulation for the electric performance of electronic packaging, and the development of electromagnetic simulation tools.

Dr. Yu-Ting Cheng was born in Taiwan, Republic of China. He received his B.S. and M.S. degree in Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan in 1991 and 1993, another M.S. degree in the field at Carnegie Mellon University, Pittsburgh, PA, in 1996, then Ph.D. degree in Electrical Engineering at the University of Michigan, Ann Arbor, in 2000. His thesis is development of a novel vacuum packaging technique for MEMS

applications. His research interests include the fundamental study of materials for MEMS applications, micropackaging, and new hybrid micromachining fabrication of microstructures, microsensors and microactuators. He joined IBM Watson Research Center, Yorktown Heights, as a research staff member and involving in several SOP (System on Packaging) projects in 2000. He is currently an Assistant Professor, Department of Electronics Engineering, National Chiao Tung University, Hsin-Chu, Taiwan. He is a member of Phi Tau Phi.

T4 - Technical Session 4: Bioinformatics (I)

Session Chair

Cheng-Yan Kao

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BIOGRAPHY

Cheng-Yan Kao was born in Taipei, Taiwan, 1948. He received B.S. in mathematics from National Taiwan University, Taipei, Taiwan, in 1971, and the M.S. degree in computer science in 1976, the M.S. degree in statistics in 1978, and the Ph.D. degree in computer science in 1981, all from the University of Wisconsin-Madison.

He worked for Ford Aerospace, the Unisys Corporation, and worked for General Electric from 1980 to 1989 at the Johnson Space Center, NASA, Houston, TX. He has been a professor with the Department of Computer Science and Information Engineering, National Taiwan University since 1990. He has published more than 40 technical papers in various journals and international conferences. His research interests include bioinformatics, biochip, evolutionary computation, optimization, and grid computing. He has been the president of Bioinformatics Society Taiwan since 2000.

T4 - Technical Session 4: Bioinformatics (I)

Distance-Based Genome Rearrangement Phylogeny

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ABSTRACT

Evolution operates on whole genomes through mutations that change the order and strandedness of genes within the genomes. These events are examples of ‘‘rare genomic changes,” which have low frequency and high signal-to-noise ratio. Thus analyses of gene-order data present new opportunities for discoveries about deep evolutionary events, provided that sufficiently accurate methods can be developed to reconstruct evolutionary trees.

In this talk I will present our results on distance-based genome rearrangement phylogeny reconstruction. We approach the problem by developing new statistically-based true evolutionary distance estimators. In our simulation study, we obtain highly accurate trees by using these new distance estimators, even when the amount of evolution in the dataset is high. Furthermore, these new methods greatly outperform previous distance-based approaches with respect to topological accuracy.

This is joint work with Robert Jansen and Tandy Warnow (University of Texas) and Bernard Moret (University of New Mexico) while the presenter was a Ph.D. candidate at the University of Texas.

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.

T4 - Technical Session 4: Bioinformatics (I)

ArrayTrack – Supporting Toxicogenomic Research at the FDA's National Center for Toxicological Research (NCTR)

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ABSTRACT

Robust bioinformatics capability is widely acknowledged as central to realizing the promises of modern omics technologies. Integrating omics data with phenotype plays an essential role in toxicogenomics to study underlying mechanisms of toxicology. At the FDA's National Center for Toxicological Research (NCTR), we are developing a public toxicoinformatics system to support toxicogenomics research. The so-called Toxicoinformatics Integrated System (TIS) integrates genomic, proteomic and metabonomic data with the data from public repositories, as well as conventional *in vitro* and *in vivo* toxicology data. This paper presents the design, practical issues and functions of the TIS for its first production module, ArrayTrack that provides for management and analysis of DNA microarray data. ArrayTrack is logically constructed of three linked components: 1) a database (MicroarrayDB) that stores microarray experimental information that is MIAME (Minimal Information About Microarray Experiments) compliant; 2) libraries (LIB) that mirror critical functional data in public databases; and 3) tools (TOOL) that operate on experimental and public data for knowledge discovery. ArrayTrack enables data curation in accordance with standard ontology and controlled vocabulary, facilitates data interpretation and provides and interfaces to a rich collection of tools for data analysis and knowledge mining. Using ArrayTrack, user can select an analysis method from the TOOL, apply the method to selected microarray data stored in the MicroarrayDB, and the analysis results can be directly linked to gene functions in the LIB. ArrayTrack is the first module of the TIS made publicly available online and from the authors upon request.

BIOGRAPHY

Dr. Tong received his Ph.D. in Polymer Chemistry in 1990, and was a research associate in computational chemistry for six years at the University of Missouri-St. Louis. In 1996, he joined an on-site IT contractor at the FDA's NCTR, and has been working on endocrine disrupting compounds using computational toxicology methods as well as developing bioinformatics approaches for genomics and proteomics research. In June of 2002, he joined NCTR as program Director of Center for Toxicoinformatics. He is also an adjunct professor in the Department of Pharmaceutical Sciences at University of Arkansas for Medical Sciences.

T5 - Technical Session 5: C4I (I): IT and Business Process Outsourcing

Session Chair

Kuan-Tsae Huang

Chairman & CEO
Taskco Corporation
www.taskco.com.tw
Tel: 886-2-8772-2300 x151
Fax: 886-2-8772-2301
Email: kthuang@taskco.com.tw

BIOGRAPHY

Kuan-Tsae Huang received the B.S. degree in Mathematics from National Taiwan Normal University, Taiwan in 1974, M.S. in Applied Mathematics from University of Illinois-Urbana Champaign in 1979, and Ph.D. in Electrical Engineering and Computer Science from MIT in 1982.

Dr. Huang is currently the Chairman & CEO of Taskco Corporation, a company focusing on e-Business and Knowledge Management Consulting and Solution Services. Merrill Lynch had rated Taskco as one of the key Asia's leading e-Business company. Taskco's core business is to help company transform into knowledge service operation with business process re-engineering and e-Business/ KM solutions. Currently, Taskco is the CIO Program Management office for Taiwan's e-Government Initiative. In addition, Dr. Huang is on the board of BioGenomix, a leading biotechnology company, and was the Chairman of Yuen-Tai VC firm (associated with Yuen-Da security firm in Taiwan). Dr. Huang was one of the pioneers in the Offshore Outsourcing business to Singapore & India based in Singapore since 1989. Recently, He was invited to a China's five city tour on IT Outsourcing by UNDEV fund at January of 2003.

Dr. Huang joined IBM Watson Research Center in 1982 as part of QBE/ OBE Database team and later hold several management positions within IBM Research and Global Services. During his Asia assignment from 1989, He was GM of Multimedia Business Unit of IBM Asia Pacific and CEO of an IBM JV company, SingaLab. From 1995, He was a Director at IBM Global Services leading the effort of Asset Reuse and Knowledge Management to help transform IBM into a global service business. Since 1998, he was the IBM Vice President to lead the worldwide e-Business implementation and Web application laboratory for IBM's Corporate transformation. He had won the Gold medal of Giga Information Award on BPR & Knowledge Management in 1998, and IBM Corporate Excellence Event Award in 1999. Dr. Huang left IBM at 2001 to start his own entrepreneur career in Asia based at Taiwan. In 2002, he is the Honor Chair Professor at the College of Management of National Sun-Yat-Sen Unviersity, Taiwan and the Chief Advisor to the Taiwan's e-Government projects since 2003. His recent research interests include outsourcing, grid computing, bioinformatics, and multimedia content management.

T5 - Technical Session 5: C4I (I): IT and Business Process Outsourcing

Deng-Chyan Chen

Managing Director, USA West Coast Office, Institute for Information Industry
President, Information Interchange, Inc

BIOGRAPHY

Mr. Deng-Chyan Chen, born in Chang-Hwa, Taiwan, started his career in Air Force service. He graduated from *the Air Force Institute of Aeronautical Technology*, and received further continuing education from University of Minnesota.

He had been participated in applying information technology to the automation and integration of logistic support related systems for Taiwan Air Force during 1968 to 1972. That system was the first On-line Real Time computer System in Taiwan.

1972, Mr. Chen joined Control Data Taiwan Branch as Application Analyst. 1977 promoted as Computer Center manager. 1987 led a team to work on Energy Management project in Minneapolis, Minnesota. Mr. Chen had successfully accomplished Taiwan , Jiangsu, and Zejiang Power Dispatching & Control Projects.

1992, Mr. Chen returned to Taiwan and joined III as a Project manager for Customs Automation and National Health Information Network projects. The successful implementation of these projects has resulted in relocated Mr. Chen to Silicon Valley. 1996, Mr. Chen was named the Managing Director of USA West Coast office of *Institute for Information Industry* (III) with the mission to assist IT technologies and talent transfer between Taiwan and North America.

T5 - Technical Session 5: C4I (I): IT and Business Process Outsourcing

Hsin-Kuo Kan

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Middletown, New Jersey
(732) 420-0120 (Office)
hkan@att.com

BIOGRAPHY

Hsin Kan is **Division Manager, Computing Center Of Excellence at AT&T Labs**. He is currently responsible for the design and development of AT&T's Electronic (Internet) Servicing Platform, and management of R&D's system capital and enterprise license agreement with vendors

Hsin joined **Bell Laboratories** in 1976. He has worked on various assignments (In Bell Laboratories, American Bell, AT&T Information Systems, and AT&T Labs) in the areas of data networking, communications software development, and network operations development. At AT&T, Hsin led and managed the development of Accumaster™ Integrator, Accumaster™ Service Workstations, Accunet™ T1.5 Information Manager, Accunet™ Bandwidth Management Service, and most recently re-engineering of AT&T Business Service Assurance Platform and Enterprise Portal (att.com)

Hsin received a Doctor of Science (Sc.D) degree in Electrical Engineering and Computer Science from M.I.T. in 1976, and a Bachelor of Science degree in Electrical Engineering from National Chiao Tung Univeristy in Taiwan. He is a member of IEEE, ACM, and Phi Tau Phi Scholastic Honor Society. He is also a 1988 and 1990 recipient of the **AT&T Architecture Awards** for his major contributions to AT&T's Unified Network Management Architecture and Reusable Software Platform Architecture. In the summer of 1999, Hsin was appointed **AT&T Fellow** for continuous and outstanding contributions in the successful design and development of mission critical systems that manage AT&T Services.

T5 - Technical Session 5: C4I (I): IT and Business Process Outsourcing

Chintay Shih

Industrial Technology Research Institute
Bldg.51,195 Sec.4, Chung Hsing Rd. Chutung, Hsinchu, Taiwan, ROC
Email: ctshih@itri.org.tw

BIOGRAPHY

Education:

Ph.D.	Electrical Engineering , Princeton University	1975
M.S.	Management, Stanford University	1985
B.S.	Electrical Engineering, National Taiwan Univ.	1968

Experience:

President of ITRI	1994～2003
Vice President of ITRI	1989～1994
VP & General Director of ERSO/ ITRI	1984～1989
Engineer Manager, Plant Manager of IC Center, Deputy General Director of ERSO/ ITRI	1976～1984
Senior Engineer, Burroughts, USA	1974～1976

Current Position

Special Advisor of ITRI	2003

Recent advisory positions:

Science &Technology Advisor of the Executive Yuan since 1998

Chairman of the Asia Pacific Intellectural Property Association since 1997

President of Chinese Business Incubation Association since 2003

T5 - Technical Session 5: C4I (I): IT and Business Process Outsourcing

Ko-Yang Wang

Ph.D., Distinguished Engineer
Research and Innovation Executive, Business Transformation
IBM Global Services
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Fax: 914-766-9238
Email: kyw@us.ibm.com

BIOGRAPHY

Dr. Ko-Yang Wang is one of the 60 Distinguished Engineers in IBM Global Services. He has over 20 years of experience in IT and specializes in the innovative uses of technology to solve business problems. He has a wide range of in-depth expertise in areas include: operational business design, business process integration and automation, business and technical architecture, knowledge management, collaboration, knowledge mining, enterprise portals, software reuse, parallel compilers, and artificial intelligence.

Dr. Wang is the Research and Innovation Executive in Business Transformation, IBM Global Services. In addition to being the focal point for Global Services/ Research relationship, he leads an IGS DE driven effort called "Enterprise of the Future." This effort focuses on developing 2-5 years visions of future business and technology game changers to help IBM and its customers set strategic directions and develop innovative thought and technology leadership.

In 2001, Dr. Wang led a cross function team on business process integration and automation to help IBM transform into a dynamic e-business. Dr. Wang was the senior development manager and chief architect for the IBM Global Services Knowledge Management Application Suite which include several applications that won the Gold Medal of the 1998 Giga Excellence award in and Knowledge and Document Management in North America and the Silver Medal of the 1999 WW Giga Excellence award for Knowledge Management. These applications were deployed to more than 100,000 IBM practitioners worldwide.
Earlier, Dr. Wang was a principal in the IBM Consulting Group. Dr. Wang led the Methods and Tools team in the Enterprise Solution Structure project of IBM Global Industries. Before joining the IBM Consulting Group, Dr. Wang was a Research Staff Member in the IBM Research. There, he contributed to the R&D of advanced technology for compilers, programming environments and runtime systems. Prior to join IBM, Dr. Wang was a senior research faculty at Purdue University.

Dr. Wang was awarded a Ph. D. and a M.S. degree in computer science from Purdue University. He also has a M.S. and a B.S. degree in Mathematics. Dr. Wang has published more than 30 technical papers. He has presented more than 40 invited talks in major universities, research laboratories and international conferences.

T6 - Technical Session 6: Nanotechnology (II)

Session Chair

Ben(jamin Thomas Peng-nien) Chu

State University of New York at Stony Brook

BIOGRAPHY

Personal Information

Home Address:27 View Road, Setauket, New York 11733
Nationality: U.S.A.; Naturalized February 13, 1968, U.S. District Court of Kansas City.
Marital Status: Married, three children.

Present Position: Distinguished Professor
Phone: 631-632-7928 FAX: 631-632-6518
E-mail: bchu@notes.cc.sunysb.edu

Education: B.S., magna cum laude, St. Norbert College, 1955
Ph.D., Cornell University, 1959

Employment History:

Research Associate with Peter J. W. Debye, Cornell University	1958-1962.
Assistant Professor of Chemistry, University of Kansas	1962-1965
Associate Professor of Chemistry, University of Kansas	1965-1968
Professor of Chemistry, State University of New York at Stony Brook	1968-1988
Chairman,	1978-1985
Professor of Materials Science and Engineering	1982-
Leading Professor of Chemistry, SUNY/ Stony Brook	1988-
Distinguished Professor, SUNY/ Stony Brook	1992-

Other Appointments:

Brookhaven National Laboratory	Summer, 1957
Univ. of New South Wales, Australia	Summer,1974 & 1994
Australian National University	Summer, 1974
Wayne State University, Detroit	May-June, 1975
Hokkaido University, Japan	July-Sept, 1975
Peking University, Fudan University, PR China	August, 1979 & 1982
Institute for Theoretical Physics, Univ. of Calif., Santa Barbara	December, 1982
External Examiner in Chemistry, Chinese University of Hong Kong	1986-1989
Science Advisory Committee, Hong Kong University of Science and Technology	1995-1997
Chinese American Chemical Society, Board of Directors	1995-1997

Editorial Boards:

Associate Editor, Materials Letters	1986-1989
Editorial Board, Journal of Colloid and Interface Science	1986-1989
Editorial Advisory Board, Macromolecules	1990-1992

Editorial Board, Review of Scientific Instruments 1993-1995
Editorial Advisory Board, Journal of Polymer Science Part B (Polymer Physics) 1990-

Fellowships, Special Invitations and Honors:

Participant of the 1966 Study Week on Molecular Forces, Pontifical Academy of Science, Vatican City, Rome, Italy.
Alfred P. Sloan Research Fellow 1966-1968
John Simon Guggenheim Fellow 1968-1969

Invitations and Honors (continued):

Visiting Professor, Japan Society for the Promotion of Science (JSPS) 1975-1976, 1992-1993
Humboldt Award for Senior U.S. Scientists 1976-1977, 1992-1993
Distinguished Achievement Award in Natural Science, St. Norbert College 1981
Fellow, American Institute of Chemists
Fellow, American Physical Society
Honorary Professor of the Chinese Academy of Sciences 1992-
High Polymer Physics Prize, American Physical Society 1993
Langmuir Distinguished Lecturer Award, Division of Colloid and Surface Chemistry, American Chemical Society 1994
Honorary Professor, Nankai University 1996-
Award for Distinguished Service in Advancement of Polymer Science, Society of Polymer Science, Japan 1997
Honorary Professor, Xiamen University 1998-
1998 Achievement Award of Chinese Institute of Engineers/ USA, Outstanding Achievement Award 1998

Lectures:

Robert R. Gilpin Memorial Lecture, Clarkson University, 1996
Collaboratus VI, Distinguished Lectures in Chemical and Biochemical Engineering, Rutgers University, 1996

Research Interests:

Techniques:

Rayleigh, Brillouin and Raman scattering;
Time-resolved small angle x-ray scattering and wide angle x-ray diffraction;
Small angle neutron scattering;
Transient electric birefringence; *Laser-induced fluorescence detection*
Rheometry; *Electrospinning.*

Topics:

Static and dynamical properties of macromolecular, colloidal, and supramolecular solutions,
Nanocomposites; *Biomineralization;*
Polyelectrolyte-surfactant complexes; *Modification of nanostructured materials;*
Supercritical fluids; *Modified fullerenes;*
Capillary electrophoresis of DNA;
Tissue engineering. *Biodegradable polymers for medical applications;*

Publications:

490 scientific papers, 5 book reviews, 6 books, 8 patents, 1 meeting report, 7 article reviews, and 17 papers in progress.

Consultantships:

1. Calgon Corporation, Subsidiary of Merck & Co., Inc., Pittsburgh, PA.
2. Brookhaven Instruments, Holtsville, New York.
3. Universities Space Research Association (USRA), Microgravity Science &

Applications Division, NASA.
4. Eastman Kodak Company, Eastman Chemicals Division, Kingsport, Tennessee.
5. Roche Diagnostic Systems, Division of Hoffmann-LaRoche, Inc., Nutley, New Jersey.
6. Bristol-Myers Squibb Company, The Squibb Institute for Medical Research, New Brunswick, New Jersey.
7. *DuPont Experimental Station, Wilmington, Delaware*
8. W. L. Gore & Associates, Inc., Elkton, Delaware.
9. Dow Chemical Company, Freeport, Texas.

Biographies:

Brief biographies have been listed; for examples, in American Men and Women of Science, *Who's Who in America*, Men of Achievement and *American Catholic Who's Who.*

T6 - Technical Session 16: Nanotechnology (II)

"The Abnormal Densities of Poly(L-lactic) Acid and Its Implication on Primary Nucleation"

Jing Wu

Assistant Professor
Otto H. York Department of Chemical Engineering
New Jersey Institute of Technology
University Heights, Newark, NJ 07102-1982

BIOGRAPHY

Dr. Jing Wu's research focuses on structure development and phase transitions in polymer systems. His Ph.D. research was under the supervision of Prof. Jerold M. Schultz of University of Delaware, during which he had studied structure development of polymer fibers using in-situ synchrotron small- and wide-angle x-ray scattering (SAXS, WAXS) techniques.
The recent work has been focused on fundamental understanding of real-time phase transformation/ crystallization in polymer solutions and gels.

T6 - Technical Session 6: Nanotechnology (II)

Self-Assembly of A Novel Asymmetrical Bolaamphiphile: Acidic Sophorolipid Molecules

Shuiqin Zhou

College of Staten Island and The Graduate Center, The City University of New York

ABSTRACT

The self-assembly of a novel asymmetrical bolaamphiphile of acidic sophorolipid molecules, consisting of a disaccharide sophorose linked to an oleic acid with a few unique structural features, has been investigated in water by light microscope, FT-IR, small-angle and wide angle X-ray scattering, as well as static and dynamic laser light scattering. Giant twisted and helical ribbons of 5-11μm wide and several hundreds micrometers long could be produced at acidic conditions. An increase in pH values induced a structural transition from the fast-grown twisted ribbons at pH < 3 to the slowly-grown helical ribbons at 3.5 < pH < 5.5. No difference was observed in both long period and short period spacing for the dried and water equilibrated ribbons at different pH values. A multilamellar structural model based on the strong disaccharide-disaccharide and carboxylic acid-carboxlylic acid hydrogen bonding and the hydrophobic association between the oleic chains was proposed. The neutralization of the acidic sophorolipid molecules with NaOH in water to pH ≥ 5.9 produced clear solutions with short-range ordered nanostructures. At pH = 5.9, nearly monodispersed large micelles organized from about 1,100 molecules with a hydrodynamic radius $\langle R_h \rangle$ of 111 nm and a ratio of radius of gyration $\langle R_g \rangle$ over $\langle R_h \rangle$ of 1.2 were determined, while at pH = 7.8, nearly monodispersed micelles organized from about 790 molecules with a $\langle R_h \rangle$ of 98 nm and a much larger ratio of $\langle R_g \rangle / \langle R_h \rangle$ of 1.7 were determined, indicating a more extended morphology. A cylindrical brush-like micellar structural model was proposed. The mechanisms of the pH-induced structural transitions of the self-assembled sophorolipid molecules were discussed.

BIOGRAPHY

Shuiqin Zhou received her B.S. (1988) and M.S. (1991) degrees from 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, respectively. Since September 2002, she has been an Associate Professor of Chemistry, The City University of New York at College of Staten Island. She has published 55 research papers and book chapters. With the NSF support, her group researches currently focus on the self-assembly of special amphiphilic molecules, such as novel fullerene derivatives, bolaamphiphilic glycolipids, and block/ graft copolymers in different environments to (1) fundamentally understand the intermolecular interactions at the nanometer scale and (2) to regulate the nanostructures of the supramolecular assemblies for applications in advanced technologies and bio-medications.

T6 - Technical Session 6: Nanotechnology (II)

Nanostructured Materials for Advanced Sensor Technology

Chuan-Jian Zhong

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ABSTRACT

The rapid development of multidisciplinary research on nanostructured materials has provided chemists with unprecedented opportunities to address various fundamental and technological challenges. We have been investigating a general bottom-up pathway for assembling nanostructured materials from core-shell nanoparticles (1~20 nm). This pathway explores a single-step assembly process involving interparticle covalent bonding, hydrogen-bonding, or multidentate ligand coordination by molecular wires. Nanocrystal cores of gold, alloy and semiconductor materials with organic monolayer shells of different functional groups (e.g., thiols, thioethers, carboxylic acids, polymeric matrix, etc.) have been studied as model systems. Our focus is the ability to control size, shape, and spacing towards novel electronic, optical, magnetic and catalytic properties. We have shown that these nanostructures are chemically responsive and fine-tunable, and present interesting opportunities to address issues in advanced chemical and electrochemical sensing technologies. We will discuss recent results of an investigation of chemical sensing of nitroaromatics, metals and biologically-relevant analytes. An important emphasis is the understanding of the correlation of the unique nanostructures with electronic conductivity, interfacial mass flow, ligand-framework molecular recognition, and catalytic properties.

BIOGRAPHY

Dr. Chuan-Jian Zhong is an assistant 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 analytical chemistry, physical chemistry, materials chemistry, surface chemistry, and electrochemistry.

The interdisciplinary nature of his research interests is reflected by his more than 70 peer-reviewed publications on a wide range of topics including nanoparticles, nanostructures, catalysis, sensors, molecular assemblies, microfluidics, conducting polymers, and miniaturized analytical instrumentation. He has in the past five years expanded his research interest to the exploration of nanotechnology, focusing on studies of nanostructured materials for advanced fuel cell catalysts and chemical/ biological sensors. His research laboratory has developed new methods and techniques to address both fundamental and practical issues in the design and fabrication of nanoparticles and nanostructures for nanotechnological applications. He is inventor/ co-inventor of three US patents, with several pending that are related to nanoparticle sensing and catalyst materials.

His research work is currently funded by National Science Foundation, American Chemical Society Petroleum Research Fund, World Gold Council, 3M, and Honda.

T6 - Technical Session 6: Nanotechnology (II)

Crystallization in Nano-confinement Cylinder and Double Gyroid Environments

Lei Zhu

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ABSTRACT

Multiple phase morphologies have been observed in a semi-crystalline polystyrene-*b*-poly(ethylene oxide) (PS-*b*-PEO) diblock copolymer with a PEO volume fraction of 37%. The sample has a double gyroid (DG) phase as cast from solution, and it exhibits cylinder phase after it is subjected to a large amplitude mechanical shear at 110 °C. Upon annealing at 150 °C, the metastable cylinder phase starts to transform back to the DG phase. Small angle X-ray scattering and transmission electron microscopy techniques are used to study the phase transitions between the cylinder and DG phases. Using differential scanning calorimetry, nanoconfined crystallization kinetics in cylinder and DG phases is studied. At low crystallization temperatures (< 34 °C), there is no obvious difference in the crystallization kinetics between the cylinder and DG phases, due to relatively high nucleation density in nanoconfined spaces. At high crystallization temperatures (> 35 °C), the crystal growth rate in the DG phase drastically decreases compared to the cylinder phase. This difference can be attributed to the morphological difference between DG and cylinder phases, since the DG phase contains continuously curved channels, which are difficult for PEO crystals to grow inside.

T6 - Technical Session 6: Nanotechnology (II)

New Nanoparticle Catalysts For Fuel Cells

Jin Luo*, Mathew M. Maye, Li Han, Nancy Kariuki, Peter Njoki, Lingyan Wang, Chuan-Jian Zhong**

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ABSTRACT

The study of nanosized gold catalysis has attracted increasing interest because of the discovery of unprecedented catalytic activity and specificity of gold at nanometer sizes [1,2]. The catalytic activity of such materials requires the ability to manipulate the interparticle spatial and surface access properties [3]. This ability is inherently linked to the controllable activation of the core-shell nanostructure, or removal or reconstitution of the shell components. In this presentation, we will discuss recent findings of an investigation of core-shell assembled gold and alloy nanoparticles as catalysts for electrooxidation of carbon monooxide and methanol. This investigation is aimed at understanding the structural and morphological evolution of the nanoparticles on the surface of support materials upon catalytic activation. The activation of the catalytic activity of the catalysts can be controlled by manipulation of the core-shell structure, interfacial reactivity, and adhesions to the supporting substrate. These findings have important implications to the design and processing of nanostructured catalysts. We are currently carrying out a theoretical modeling of the thermally-induced effects in terms of surface free energy and adhesion, and developing an in-depth understanding of the size evolution as a function of temperature and substrate properties.

BIOGRAPHY

Dr. Jin Luo is a senior associate scientist working in the Department of Chemistry (C.J. Zhong's Laboratory) at SUNY-Binghamton. He received his Ph.D. in Physical Chemistry at Xiamen University and the University of Tokyo (1990), where his thesis research involved photoelectrochemistry and spectroelectrochemistry. Before joining the SUNY-Binghamton research team, he was an associate professor at Xiamen University and a visiting scientist at SUNY-Potsdam.

His research interest involves interfacial electrochemistry, nanoparticle catalysis, scanning probe microscopy, and spectroelectrochemical techniques. In his early research appointments, he investigated organic molecular monolayers in two dimension using electrochemical techniques, and developed novel chemical systems using confined enchant layer technique, a new three-dimension microfabrication technology, which were funded by the National Natural Science Foundation of China. He also investigated photoassisted catalytic degradation of environmentally hazardous organic pollutants using nanostructured electrodes.

He is currently developing advanced nanomaterials for nanotechnological applications. One focused area is the development of nanoparticle catalysts for fuel cells, supported by both federal and industrial funding.

T7 - Technical Session 7: MEMS (II)

Session Chair

Susan Z. Hua

Director, Bio-MEMS Facility and Research Associate Professor
Department of Mechanical and Aerospace Engineering,
SUNY-Buffalo, Buffalo, NY 14260
Tel: 716-645-2593 ext. 2358
Email: zhua@eng.buffalo.edu

BIOGRAPHY

Prof. Zonglu Hua is the Director of Bio-MEMS Center in the School of Medicine and also an adjunct associate professor in the Mechanical and Aerospace Engineering Department at SUNY-Buffalo. Her research interests include Bio-MEMS, biosensors, microfluidic lab-on-a-chip, as well as Ballistic Magnetoresistance nanomaterials.

Dr. Hua received her Bachelor and Master degrees in Physics from Peking University in China, and Ph.D. degree in Material Science and Engineering from University and Maryland. After graduation, she went to NIST as a postdoc and worked on multilayered Giant Magnetoresistance (GMR) materials.

Prior to joining the bio-MEMS center at in SUNY-Buffalo, she worked in a privately owned company in NH for six years first as senior R&D scientist and later as the technical director in charge of the Applications Division. There she was involved in development of new products, scaling up process, and advancing applications. One of the main products she developed was a microfabricated magnetic-based sensor.

T7 - Technical Session 7: MEMS (II)

Magnetic Colloids: From Nanostructures to Complex Systems

Weili Luo

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407-823-5855(O); email: luo@ucf.edu

ABSTRACT

Magnetic colloids consist of magnetic nanoparticles suspended in nonmagnetic solvent. The ability for particles to rearrange themselves in the liquid environment in response to particle interaction or external influences give rise to rich phenomena ranging from self assembly of the nanoparticles, gas-liquid and liquid-solid transition of these particles, to nonlinear spatio-temporal patterns. Applications from studying these phenomena can be found in automobile shock absorbers, liquid optical devices, to drug delivery agents.

BIOGRAPHY

CURRENT POSITION

Professor, Department of Physics, University of Central Florida.

EDUCATION

Dec. 1989	Ph.D., Physics, UCLA. Dissertation: "Spin Glass and Spin Glass Like Materials." Advisor: Prof. Raymond. L. Orbach
March, 1985	Master, Physics, UCLA.
March, 1982	BS, Physics, Peking University, Beijing, China.

EMPLOYMENT HISTORY

2002-present	Professor, Department of Physics, University of Central Florida.
1996-2002	Associate Professor, Department of Physics, University of Central Florida
1992-1996	Assistant Professor, Department of Physics, University of Central Florida.
1990-1992	Postdoctoral Fellow, The James Franck Institute and the Department of Physics, University of Chicago.
1984-1989	Research Assistant, Department of Physics, UCLA.
1984-1986	Teaching Assistant, Department of Physics, UCLA.

HONORS

2003	Outstanding Researcher, College of Arts and Sciences, UCF
2001	Research Incentive Award, UCF
1997	Presidential Merit Award, UCF
1996	Wang Kuancheng Young Scientist Award
1994	NSF Young Investigator Award, Condensed Matter Physics.
1989	Graduate Woman of the Year, UCLA.

PROFESSIONAL ACTIVITIES

August 2003	Advisory Board, 9th International Conference on Electrorheological Fluids and Magneto-rheological Suspensions, Beijing, China.
July 2001	Visiting Professor, The International Center for Theoretical Physics, Trieste, Italy.
2001	International Steering Committee, 8th International Conference on Electrorheological Fluids and Magneto-rheological Suspensions, Nice France
July 2000	Science Consultant, United Nation Development Program.
March-June 2000	Visiting Professor, University of Hannover, Hannover, Germany.
March 1999 American	Chair, "Magnetism Focused Session: Magnetism in Soft Matter," Physical Society Centennial Meeting, Atlanta, Georgia.
January 1999	Co-Chair, "Magnetic Fluids," 12th International Winter School on Continuous Media Mechanics, Perm, Russia.
Nov. 1998,	Chair, "Magnetic Fluids," 43rd Annual International Conference on Magnetism and Magnetic Materials, Miami, Florida.
March 1996	Chair, "Colloidal Interactions," American Physical Society Annual March Meeting, St. Louis, Missouri.
March 1995	Chair, "Ferrofluids and Electro-Rheological Fluids," American Physical Society Annual March Meeting, San Jose, California.
March 1992	Chair, Invited Symposium "Slow Relaxation," American Physical Society Annual March Meeting, Indianapolis, Indiana.
1990—1999	Editorial Board, International Journal of Modern Physics B.
1990—1999	Editorial Board, Modern Physics Letters B.

RESEARCH FUNDINGS

1. Weili Luo (PI), "Fundamental and Applied Research on Ferrofluids." National Science Foundation Young Investigator Award, $312,500. 1994-1999. Co-PI: none

2. Weili Luo (PI), "Fundamental and Applied Research on Ferrofluids." Eastman Kodak Company, equipment-matching fund for NSF Young Investigator Award, $187,500, 1995-2000. Co-PI: none.

3. Weili Luo (PI), "Field Induced Instabilities and Bifurcations in Magnetic Fluids." National Science Foundation, $80, 000, 1998-1999. Co-PI: none.

4. Weili Luo (PI), "Field-controlled Fluidic Damper", Lockheed-Martin Company, $85,000, 1999-2000. Co-PI: none.

5. Weili Luo (PI), I-4 matching fund Phase I for Lockheed-Martin Company, University of Central Florida, $55,000, 1999-2000. Co-PI: none.

6. Weili Luo (PI), I-4 matching fund Phase II for Lockheed-Martin Company, University of Central Florida, $15,000, 2000. Co-PI: none.

7. Weili Luo (PI), "Experimental and Theoretical Investigations on Field-induced Instabilities in Magnetic Fluids." National Science Foundation, $336, 205, 2000-2003. Co-PI: none.

8. Weili Luo (PI), "Instabilities in Magnetic Fluids in Terrestrial and Microgravity Environments." NASA, $66,000, 2000-2003. Co-PI: none.

9. Weili Luo (PI), "Self-Assembly of Magnetic Nanostructures and Its Related Enabling Technologies," National Science Foundation Nanoscale Interdisciplinary Research Team, $1,200,000. 2001-2005. (with four other Co-PIs).

10. Weili Luo (PI), "Self-Assembly of Magnetic Nanostructures and Related Enabling Technologies," University of Central Florida, $307,611, Matching Fund for NSF, August 2001-July 2005. (with four other Co-PIs).

T7 - Technical Session 7: MEMS (II)

Design and microfabrication of Bio-AFM cantilevers/ tips

Xiaoyu Yang

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Tel: 716-940-1365
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ABSTRACT

Since its inception in 1986, AFM has found widespread use in surface imaging and manipulation. Moreover, AFM's high vertical resolution can be used to probe chemical forces, as small as weak in pN regime. The most important part of an effective AFM setup is the cantilever. Cantilever's morphological and mechanical properties dictate experimental limits of acquisition rate, signal to noise ratio (SNR) and minimal interaction force (Fmin). A lever that is suitable to image hard surfaces in air has a high-aspect ratio tip and high resonant frequency for fast and accurate data acquisition. However, viscous damping coefficient (R), spring constant (k) and Fmin need not be low because samples are hard and air is not a viscous medium. Thus, commercially available cantilevers are fabricated hundreds of microns long and more than a half of a micron thick, with kHz range resonant frequency and spring constants in N/ m.

In contrast, Bio-AFM (working on soft samples in aqueous media) requires cantilevers with small spring constants k in order to examine small features and weak forces. To produce cantilevers that are more suited for sensitive operation in a viscous environment, short and thin levers were designed to both reduce spring constants and to eliminate difficulties associated with AFM setups adjustment and fabrication process. In current design, a cantilever has been functionalized into three parts: stiff beam, hinge and a head. The tip is located 200 microns away from the die, separated by variable length of stiff beam and hinge. This design allows straight-forward integration into standard AFM setups. Moreover, the effective lever, consisting of the hinge and the head, is short (15-60 microns) and thin (<100nm). Fabricated levers have small k (~ 0.01N/ m), high resonant frequency (kHz) and low R.

BIOGRAPHY

Xiaoyu Yang is currently a Research Scientist with Novascan Technologies, Inc., Ames IW. He is responsible for design of micro/ nano scale MEMS structures and AFM cantilevers and tips, characterization/ simulation of bio-MEMS device and high sensitive AFM probes and force measurement by AFM probes. He works as a representative of Novascan Technologies at CNF (Cornell Nanofabrication Facility) and Biophysics Department at State University of New York at Buffalo (SUNY at Buffalo). Xiaoyu Yang was awarded his PhD degree in Mechanical Engineering and Materials Science by the State University of New York at Buffalo (SUNY at Buffalo).

T7 - Technical Session 7: MEMS (II)

Sequential Electrolytic Bubble-Based Micro-Pump

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ABSTRACT

Development of microfluidic lab-on-a-chip technology requires accurate control of fluid flow with easy on-chip electrical flow control at low power. Various micromachined pumping schemes have been developed. Electrolytic bubble-based pumps are of interest since they are simple to microfabricate, need low power (microwatts), adapt easily to varying channel configurations, with response time for bubble inflation/deflation in the millisecond range. An electrolytic bubble actuated micropump has been fabricated and characterized for dosing applications. The micropump consists of a series of bubbles formed directly inside a microfluidic channel, and the volume displacement characteristics of inflating/deflating electrolytic bubbles are utilized to move the liquid along the channel. Prototype chips with five sequential bubbles were built using standard photolithography techniques. The pump performance was characterized as a function of the voltage required to generate electrolytic bubbles of varying size, pulse-width, time interval between pulses, and backpressure; each parameter being varied independently. It was found that the size of the bubble, and hence the quantity of liquid displaced, increases with voltage. Also, the pump rate increases with a reduction in pulse-width and the time interval between pulses. The optimum pump rate of 24 nl/min, corresponding to a flow velocity of 640 μm/s, was obtained for the current channel size of 25x25μm in cross-section. The pump performed successfully against backpressures up to 107 kPa.

BIOGRAPHY

Prof. Zonglu Hua is the Director of Bio-MEMS Center in the School of Medicine and also an adjunct associate professor in the Mechanical and Aerospace Engineering Department at SUNY-Buffalo. Her research interests include Bio-MEMS, biosensors, microfluidic lab-on-a-chip, as well as Ballistic Magnetoresistance nanomaterials.

Dr. Hua received her Bachelor and Master degrees in Physics from Peking University in China, and Ph.D. degree in Material Science and Engineering from University and Maryland. After graduation, she went to NIST as a postdoc and worked on multilayered Giant Magnetoresistance (GMR) materials.

Prior to joining the bio-MEMS center at in SUNY-Buffalo, she worked in a privately owned company in NH for six years first as senior R&D scientist and later as the technical director in charge of the Applications Division. There she was involved in development of new products, scaling up process, and advancing applications. One of the main products she developed was a microfabricated magnetic-based sensor.

T8 - Technical Session 8: System-on-Chip (II)

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 180 technical papers in these areas.

Dr. Hu is a fellow of IEEE. He is a former associate editor (1988-1990) for the IEEE Transaction of Acoustic, Speech, and Signal Processing in the areas of system identification and fast algorithms. He is currently associate editor of IEEE Signal Processing letters (2002-2003), Journal of VLSI Signal Processing, and European Journal of Applied 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 is a former 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 Internation conference of Multimedia and Expo on behalf of IEEE Signal processing society.

T8 - Technical Session 8: System-on-Chip (II)

Baseband Signal Processing IC for Wireless Communication Systems

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ABSTRACT

Wireless LAN data services as well as voice and low-rate data services offered by cellular communication systems now permeate the high-tech society around us and they have become indispensable. With the ever-increasing demand for access speed come endless efforts in applying more and more sophisticated modulation/reception techniques in communication systems. In the area of baseband communication circuits, extensive knowledge in communication theory, EM wave propagation, RF electronics, signal processing, and circuit design is required. In this talk, I will first present a design methodology for digital baseband communication IC, by which we have generated several successful communication ICs. Then, the design of an OFDM baseband receiver IC, a key component in high-rate wireless LAN, is presented. We have integrated carrier frequency synchronization, symbol boundary estimation, channel estimation and frequency-domain equalization in this receiver. The complexity and power consumption of the chip are minimized by full-custom memory blocks, word-length optimization, and innovative architecture. This chip has a core area of 4.6 x 4.1 mm^2. When running at 20 MHz, the chip consumes 66 mW from a 2.3-V supply. Measured packet error rates indicate that the chip can operate reliably in a multipath fading environment.

BIOGRAPHY

Tzi-Dar Chiueh was born in Taipei, Taiwan on July 3, 1960. In 1983, he received the B.S.E.E. degree from the National Taiwan University, Taipei, Taiwan. He also received the M. S. and Ph. D. degrees in electrical engineering from the California Institute of Technology, Pasadena, California, in 1986 and 1989, respectively. Since 1989, he has been at the Department of Electrical Engineering, National Taiwan University, where he is presently a Professor. As of 2001, he is jointly appointed by the Graduate Institute of Electronics Engineering. His research interests include integrated circuit design for digital communication and neuro-morphic systems. He has published over 100 technical papers and holds 7 Taiwanese patents and 4 US patents. He also received the 2003 National Science Council Technology Transfer Award for his contribution in developing and transferring two technologies, W-CDMA baseband receiver and OFDM WLAN baseband receiver, which have been transferred to ITRI.

Dr. Chiueh is a senior member of the Institute of Electrical and Electronic Engineers.

T8 - Technical Session 8: System-on-Chip (II)

Characterization of Logic Circuit Techniques for High Leakage CMOS Technologies

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ABSTRACT

Channel subthreshold and gate leakage currents are predicted by many to become much more significant in advanced CMOS technologies and are expected to have a substantial impact on logic circuit design strategies. To reduce static power, techniques such as the use of monotonic logic and management of various evaluation and idle modes within logic stages may become important options in circuit optimization. In this paper, we present a general, multilevel model for logic blocks consisting of logic gates that include a wide range of options for static power reduction, in both the domains of topology and timing. Existing circuit techniques are classified within this framework and experiments are presented showing how aspects of performance might vary across this range in a hypothetical technology. A brief discussion follows on how circuit optimization might evolve in the future.

BIOGRAPHY

Phillip Chin was born in Boston, MA in 1979. In 2002, he received his Bachelors of Science degree (magna cum laude) in Electrical Engineering from Brown University, Providence, RI. He is a member of Tau Beta Pi and Sigma Xi honors societies. Currently, he is a M.S./Ph.D. candidate in Electrical Engineering in the Columbia Integrated Systems Laboratory at Columbia University, New York, NY. Starting in 2003, he has been a Research Staff Intern at the IBM T.J. Watson Research Center, Yorktown Heights, NY. His current work and interests involve high performance, low power, and low leakage circuit techniques for future technology generations.

George Gristede was born in Mt. Kisco, NY, USA in 1962. In 1984 he graduated from Columbia College with a B.A. degree in Professional Option Engineering. In 1985, 1988, 1990, and 1992, he received the B.S., M.S., P.Phil., and Ph.D. degrees from Columbia University, all in Electrical Engineering. His Ph.D. thesis dealt with the derivation of a new mathematical formulation for analyzing the convergence properties of relaxation-based simulation methods. In 1992, Dr. Gristede joined the IBM Thomas J. Watson Research Center as a Research Staff Member where he has done extensive work in the areas of high-performance, low power circuit design and the development of a new generation of custom CAD tools to support such designs.

His research interests include circuit design, automated circuit checking and optimization. Dr. Gristede is a member of Tau Beta Pi and Eta Kappa Knu.

Charles Zukowski was born in Buffalo, NY in 1959. He received the B.S., M.S., and Ph.D. degrees in electrical engineering from the Massachusetts Institute of Technology, Cambridge, MA, in 1982, 1982, and 1985, respectively. Since 1985, he has been on the faculty at Columbia University, where he now has the title of Professor of Electrical Engineering, and where he also served as EE Department Chair from 2000-2003. He is currently Associate Director of the NY Microelectronics Design Center (MDC) and Technology Program Co-Chair for the GLSVLSI Conference. Dr. Zukowski received an NSF Presidential Young Investigator Award in 1987 for research on VLSI CAD. He is a regular reviewer for IEEE journals and conferences. His current interests include CMOS circuit design and special architectures for simulating gene regulatory networks.

T8 - Technical Session 8: System-on-Chip (II)

A Formal Verification Platform for SoC

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ABSTRACT

How to verify a System-on-a-Chip (SoC) has been an important issue in an SoC design process due to its complexity. The capacity of traditional verification techniques such as simulation or emulation is no longer adequate for SoC. Nevertheless, formal verification that allows exhaustive coverage and generates counterexamples is expected to be a complementary solution. Several researches on formally verifying an SoC have demonstrated its feasibility and benefits, but the entrance barrier is still very much high for engineers as evidenced by the fact that there is no platform-based utility for formal verification of SoC. In this work, a *Formal Verification Platform* (FVP) is proposed. FVP accelerates the formal verification of an *Intellectual Property* (IP), just as a hardware platform accelerates prototype verification. The model checker SGM is used in FVP and currently we support ARM AMBA and IBM CoreConnect based SoCs.

BIOGRAPHY

Pao-Ann Hsiung received the B.S. degree in Mathematics and the Ph.D. degree in Electrical Engineering from the National Taiwan University, Taipei, Taiwan, in 1991 and 1996, respectively. From 1996 to 2000, he was a post-doctoral researcher at the Institute of Information Science, Academia Sinica. From February 2001 to July 2002, he was an assistant professor in the Department of Computer Science and Information Engineering, National Chung Cheng University, Chiayi, Taiwan. He is currently an associate professor.

Dr. Hsiung was the recipient of the 2001 ACM Taipei Chapter Kuo-Ting Li Young Researcher for his significant contributions to design and verification of electronic systems. He has published more than 80 papers in international journals and conferences. He has been taking an active part in serving for international journals and conferences.

His main research interests include: SoC design and verification, embedded software synthesis and verification, real-time system design and verification, and hardware-software codesign and coverification.

T9 - Technical Session 9: Bioinformatics (II)

Medical Genomics and Genome Medicine: a computational practice

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ABSTRACT

Genomics and proteomics are driving the change of medical education and practices. My current research focuses on three major diseases: brain disorder, lung cancer, and breast cancer. In this talk, I will demonstrate a new data mining algorithm to discovery human sequence variations by exploiting expression profile data. As a proof of principle, we applied this method to breast cancer patients, and quickly discovered a previously unknown SNP. This technical innovation reuses the Affymetrix data from expression profiling. Thus, it has zero add-on expenses of data acquisition, which makes it a cost-effective way to discover disease-related gene variations. As time permits, I will also discuss the modeling study of lung and brain diseases.

BIOGRAPHY

Dr. Simon Lin is the technical manager of the bioinformatics core facility at Duke University Medical Center since 1999. He was appointed as a research assistant professor since 2002. His research interest includes medical genomics data mining and knowledge discovery. He edited three books on Microarray Data Analysis. Besides research, he is teaching Genome Informatics, a new course in the Ph.D. program of Bioinformatics.

Dr. Lin received his M.D. degree from the medical scientist training program at Peking University School of Medicine in 1996; and his M.S. degree in molecular biophysics from University of North Carolina at Chapel Hill in 1999.

In the 80s, he was a lead software engineer in the Golden Apple software development team. Products focused on icon-based multilingual and multimedia operating system running on Rockwell 6500 CPUs, including Apple II, Commodore 64, and CEC computers. In the 90s, he developed interests in medical informatics. His dissertation project was a bioinformatics study on mRNA structures. It resulted in a computer program to optimize protein production for biopharmaceutical industry. During his training in biophysics at the University of North Carolina at Chapel Hill, he developed a high-throughput drug screening assay and discovered a novel activator of a calcium channel by computational chemistry.

He is the founding chair of an annual international conference on the Critical Assessment of Microarray Data Analysis (CAMDA). He is on the scientific committee of ACM BioKDD workshops, and the Atlantic Symposium on Computational Biology. He is also on the board of the Association of Chinese Bioinformaticians (ACBIX), a non-profit organization registered in the State of Pennsylvania to promote career development for Chinese bioinformatics professionals.

T9 - Technical Session 9: Bioinformatics (II)

Normalization for cDNA Microarray Experiments having many Differentially Expressed Genes

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ABSTRACT

This talk discusses two normalization methods for cDNA microarray data in which a substantial proportion of genes differ in expression between the two mRNA samples, or there is no symmetry in the expression levels of up/down-regulated genes. The first method concerns the situation that there are no control DNA sequences on the slide. The first step of this approach is to perform global normalization based on dye-swap experiments, and then use a statistical criterion to select a set of (almost) constantly expressed genes. Based on this set, intensity dependent normalization is carried out using local regression method. The usefulness of this method is clearly demonstrated in simulation studies and in the analysis of real data sets. In particular, it is shown in the simulation studies that this method identifies genes with a lower false positive rate and a lower false negative rate than a commonly used method, when a large number of genes are turned up or down. The second method concerns the situation that there are control sequences on the slide. Calibration curves relating fluorescence signal intensities to gene expressional levels are considered in the context of Baysian isotonic regression, which makes use of smooth priors on Bernstein polynomials and Markov Chain Monte Carlo methods to study the isotonic regression problem. The second method is applied to identity early onset genes in the study of transcriptional profiling of Autographa Californica multiple polyhedrosis virus.

BIOGRAPHY

I-Shou Chang is an Investigator in the President's Lab. and the Director of the Department of Research Resources, National Health Research Institutes, Taiwan. His current research interests include analysis of cDNA microarray data, genetic linkage analysis, and genetic epidemiology where age-of-onset is the main phenotype. He works with his staff in the Department of Research Resources to make National Health Insurance Data available for researchers in Taiwan, and to make biological sequence analysis tools, including GCG and EMBOSS, freely available to all investigators in Taiwan.

I-Shou Chang received his BS from National Tsing-Hwa University, Hsin-chu and PhD from Columbia University .

He joined National Health Research Institutes, Taiwan in 2000. He was Associate Professor and Professor in the Mathematics Department at National Central University, Taiwan from 1976 to 2001. He has conducted research in mathematical statistics, biostatistics, and their applicationns.

T10 - Technical Session 10: C4I(II): On Demand Computing Technologies

Session Chair

C. Eric Wu

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BIOGRAPHY

C. Eric Wu received his B.S. from Department of Electrical Engineering, National Taiwan University, Taiwan in 1981, and M.S. and Ph.D. from Department of Computer Science and Engineering, Michigan State University in 1985 and 1987, respectively.

He joined IBM Research in 1987 and has 16 years of experience in the information technology industry. As a senior member of IEEE, he has published more than 50 technical papers and patents in computer related areas and received Best Paper Awards at ICPADS'96 and ISHPC'97. He has been leading several research and development projects in the areas of Web-based system management and Web/Grid services since 1999, including a Linux system management framework, CIMOM (Common Information Model Object Manager) providers, and trace generation and multiple Gantt chart visualization for IBM Scalable Parallel systems.

His current interests include Linux, resource management, Grid computing, and autonomic computing. Recently he leads a team at IBM T. J. Watson Research Center and developed the package "Manageability Services for Linux", available at http://alphaworks.ibm.com/tech/gems through IBM AlphaWorks -- an IBM website for downloading pre-product packages. Manageability services are Grid services with sensors and actuators for managing system resources. The package is currently one of the top downloaded packages in the "Grid Computing" zone at IBM AlphaWorks.

T10 - Technical Session 10: C4I (II): On Demand Computing Technologies

IBM On-Demand Computing

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ABSTRACT

In order to achieve competitive advantage, businesses must be able to adapt to changing conditions and to react quickly to new opportunities. Time to market is essential in today's competitive e-business environments and companies are critically dependent on the functions and services provided by their IT infrastructures. The single most defining characteristic of the On Demand computing paradigm is the overriding goal to turn Information Technology (IT) infrastructures into a powerful instrument supporting an organization's business objectives. This requires a fundamental change in the way that IT infrastructures are designed, built, and managed. That is, building an extendable and industry-wide computing platform, consisting of dynamically compose-able components with industry standard interfaces that virtualizes required resources, and can be managed autonomically. As an example, the on-line media and entertainment industry will be used to illustrate the values of on-demand computing.

BIOGRAPHY

Tan Lu is currently a lead architect for IBM's on-demand computing initiative, based in Poughkeepsie NY. He is responsible for working with customers to understand their real-life pain-points, and architecting on-demand technologies along with other IBM lead architects to addressing those pain-points.

In his previous assignment, Tan was a lead architect responsible for architecting the I/O subsystems for IBM's z990 machine. In both his current and previous jobs, he has been involved with various standards groups.

Tan Lu was awarded his Masters and Bachelor degrees in Electrical Engineering by the Carnegie Mellon University (CMU), and is currently getting his MBA in Columbia University's Executive MBA program. Tan joined IBM in 1999 as a system architect, and since then have architected many products that are delivered to the market.

T10 - Technical Session 10: C4I (II): On Demand Computing Technologies

Proactive and Autonomic Computing: A Software-enabling Platform for the Enterprise

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ABSTRACT

The depth and breadth of many complex systems, much like that of icebergs, may not be readily apparent – but what is submerged also keeps them afloat. The payback from deeply rooted autonomic computing will be found in how self-managing and self-correcting features can be aligned with business objectives and processes to allow IT staff to better serve the ever-changing demands of the business world.

We see autonomic computing as a precursor for on demand computing that eventually will lead to the consumption of computing resources – such as server capacity, storage and bandwidth – much like we see today through utilities for water, natural gas and electricity. First, though, the IT industry has to incorporate self-managing, self-correcting and self-recovering features that make possible highly reliable, unattended operations, while maintaining resources and bandwidth at high availability. Fundamentally, the foundation of any software-enabling platform for the enterprise must be built correctly with these goals in mind.

The recent development of our agile computing platform, Sequoia Media Manager (SMM), provides examples of how architecture and design rooted in such autonomic and proactive computing considerations can help increase both applications robustness and agility – and in so doing help a wide variety of possible customers better meet what are likely to be ever-changing business needs. Likely next steps in the evolution of SMM's autonomic and proactive capabilities are also explored with analysis of how they are likely to help enterprises deploying business solutions. Lastly, the real-world challenges facing ISVs in this arena will be outlined with an eye towards helping autonomic computing gain even more traction – and towards generating real-world payback.

BIOGRAPHY

Andy G. Lean is a co-founder and Chief Technology Officer of Sequoia Broadband, Inc., which provides software, solutions and services for the targeted, managed delivery of digital media for dynamic signage, e-learning, in-store TV, and kiosk networks.
Mr. Lean has over 20 years of experience in the computer industry, including 18 years of experience in leading multimedia and telecommunications projects at IBM Thomas J. Watson Research Center, IBM Telecommunications and Media Solution Unit and IBM Broadcast Solutions Center. Milestones include the design of the first IBM JPEG/ MPEG Codec PC board, development of multicast IP networks for audio and video delivery over the LAN and WAN, and the prototype of a pilot network for multimedia services over an Intranet.

In his later part of IBM career, Mr. Lean worked with IBM Telecommunications and Media Industry Solution Unit where he led a team that launched a Near Video On-Demand solution for the Cable and Broadcast Industry. He also conceived and initiated IBM's ADSL Broadband

Internet First-Of-A-Kind solution, which provided the field trial for broadband cable and ADSL networks for Telcos and CATV. Mr. Lean also represented IBM in the ADSL Forum and contributed to ADSL's network management workgroup in 1996 and 1997. He holds many US and foreign patents, as well as IBM Research Division awards. In 1997, he was an invited Adjunct Professor of CS/EE Department of Polytechnic University in New York.

T10 - Technical Session 10: C4I (II): On Demand Computing Technologies

On-Demand Business Collaboration

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ABSTRACT

Current trends in business transformation is increasingly leading to an outsourcing and on-demand model, where the Enterprise is no longer considered a single company, but a value chain of companies in a complex web. It is in this environment that business collaboration, the process through which two or more parties interact, provides its best value, through automated facilitation and management of information exchange and control.

The On-Demand Business Collaboration (OBC) technology by IBM Research aims at providing an infrastructure that solves the complex business collaboration problems across multiple enterprises. The infrastructure enables efficient and effective business information exchange, process tracking, and visibility control. The Collaborative Exchange Protocols (CxP) created for OBC overcomes the shortcomings of other protocols, such as Rosetta Net, where all data must be aggregated before transmitting. In addition, CxP provides the flexibility to send nonstandard data within the standard mechanism and enables monitoring of states for both processes as well as documents. Other On-Demand aspects to be discussed are the CxP plug-in framework to create and customize plug-in business collaboration protocols, and the Action Manager to provide a "Plug-and Play" type of integration of new applications into existing business process infrastructure.

An on-going pilot engagement of the OBC technology is at Taiwan, backed by government funding, partnered with the Institute for Information Industry (III), with the objective to create a new standard for design collaboration. An effort has been started with the Rosetta Net standards committee to include the CxP enabling framework and business process definitions into the standards specification.

BIOGRAPHY

Tian Chao is an Advisory Software Engineer in the e-Business Solutions and Autonomic Computing Department at the IBM T.J. Watson Research Center. Her work at the Research Division has focused on adaptive and collaborative business solutions, Web services, and the security in the Business Process area. Ms. Chao has developed and submitted four IBM alphaWorks technologies in the Web services area. She has also filed many patents and published many papers, several of which have received best paper awards. She was the key developer for the first prototype that integrates Web Services with IBM WebSphere Business Integration Connect (WBIC), showcased at major conferences like Java One and Melded Conf. She also designed the end-to-end Web Services security model for a WBIC related platform. In addition, Ms. Chao has been profiled in the Woman Engineer Magazine. Prior to joining the Research Division, Ms. Chao worked at IBM TPF Systems Development Lab. Ms. Chao received a master's degree in Computer Science from Virginia Tech, and a bachelor's degree from National Taiwan University.

T10 - Technical Session 10: C4I (II): On Demand Computing Technologies

On-Demand Business Process Monitoring & Management

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ABSTRACT

The growing number of business process solutions demands platforms which enable developers to build management applications in a more efficient manner. We will present an adaptive platform, called BPMM (Business Process Monitoring & Management), for managing business process solutions. A business process solution affects many enterprise entities: multiple business processes, different organizations, various execution platforms, multiple trading partners, and constantly changing business context. Building platforms for business process solutions is a difficult task. The development of platforms for managing business process solutions poses an even greater challenge. The BPMM platform is our response to this challenge by creating an adaptive environment so that developers can leverage it to build management applications in the domain of business process solution management. Especially, BPMM supports on-demand monitoring and management via both architecture and policy framework.

The BPMM project is a joint effort between SWG S&S and IBM Research. The BPMM infrastructure has in fact been applied to various domains including insurance, supply chain, logistics and banking; and has proven to be an effective platform to achieve on-demand monitoring and management. The BPMM infrastructure will be presented in this talk, covering the following subjects:

- BPMM Foundation
- BPMM Policy Framework
- BPMM Architecture & Implementation
- BPMM Use Case Scenarios

We will also introduce how the BPMM infrastructure can be treated as an autonomic business activity management platform that supports a complete functionality to sense, interpret, predict, automate and respond to business activities and aims to decrease the time it takes to make the business decisions. Actually, there should be almost zero-latency between the cause and effect of a business decision. Our architecture enables analysis across corporate business processes notifies the business of actionable recommendations or automatically triggers business operations, effectively closing the gap between business intelligence systems and business processes. The presentation will focus on demonstrating how on-demand monitoring and management can be realized via the BPMM infrastructure in an autonomic fashion.

BIOGRAPHY

Jun-Jang Jeng (JJ) joined IBM Research in January, 1999 and is currently working for the Department of e-Business Solutions and Autonomic Computing. He is serving as the Technical Lead for project Business Process Monitoring & Management (BPMM), which is also called BAM-COSaR (Business Activity Management, Continual Optimization, Sense-and-Respond). BPMM is a joint effort between IBM Research (Watson and Haifa Labs) and SWG AIM. In 2002/2003, three milestones of BPMM have been completed: (1) Nekema in the domain of insurance collaboration hub, (2) MD for the domain of Microelectronic Manufacturing in Supply Chain Management and (3) Transportation Management Services for IGS/SO. BPMM is one of the major propellants for IBM's product offerings on Business Activity Monitoring (BAM) from 2004 and beyond. Prior to the current organization, JJ Jeng worked for the Knowledge Management group working on the project Deep Blue. Before IBM, JJ Jeng worked for the AT&T Labs as Senior Member of Technical Staff. While in AT&T, he led the development efforts on various telecommunication service provisioning systems and, in the meantime, chaired Object-Oriented Technology Committee for promoting OO technologies to many business units. He and his team won 1997 AT&T Best Software Award. JJ Jeng taught in three universities: The George Washington University (Assistant Professor), Rutgers University (Adjunct Professor) and NJIT (Adjunct Professor). JJ Jeng received his doctorate degree in Computer Science from Michigan State University in 1994. He has published more than 50 technical papers and filed 6 patents. He is an IEEE member.

Day2

Keynote Speech

Conference Chair

Ruby Lee

Princeton University

ABSTRACT

Cyber security provides assurances and safeguards necessary for the smooth functioning of cyber space interactions and services. Such interactions and services are built upon hardware and software technology for computing, communications and storage. Yet hardware and software technology has not had trustworthy operations as a fundamental design goal. Rather, the increase in transistors in chips, and our educational and research efforts, have been directed mainly towards improving performance, cost and power in hardware, and improving functionality, versatility and ease-of-use in software. Approaches to cyber security have focused on reactive measures, perimeter security and software implementations.

In contrast, I propose that it is time for a proactive approach to cyber security, where every component - hardware, software or networking - has trustworthy operation as a primary design goal. Architecture for cyber security must be defined at many levels. While security has been studied and added to different software levels, it is essentially missing at the global level and the core hardware level. If we want core hardware, including processors, to be more responsible for cyber security, what architectural features must be included? How do we translate business and personal security needs, in addition to military and national security needs, into scalable technology features? How can we protect service availability needs from malicious Distributed Denial of Service attacks? How can processors provide authentication, integrity and confidentiality for e-commerce and e-services without sacrificing performance? How can anti-piracy mechanisms and fair use both be provided in digital rights management?

BIOGRAPHY

Professor 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 architecture at both the global GRID architecture level and the core processor architecture level. She has also designed PLX, a very fast, tiny, multimedia-capable processor for information appliances, and her students are continuing to improve the PLX test-bed for processor architecture research, education and automatic synthesis. Her group explores the design of security features that can be integrated into microprocessors, application-specific instruction processors (ASIPs) and system-on-chips (SOCs). Her research also includes architecture for very high-performance microprocessors and supercomputers on a chip. Prof. Lee teaches an undergraduate course in "Cyber Security" and a graduate course in "Processor Architectures for New Paradigms."

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 initial definition and the evolution of the PA-RISC processor architecture used in HP servers

and workstations. She was the technical lead in the first CMOS PA-RISC microprocessor. 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. She pioneered the introduction of multimedia instructions in microprocessors. This enabled her multimedia team to produce the industry's first real-time, high fidelity, streaming MPEG video and audio product implemented entirely in software on low-end computers. Dr. Lee also co-led an Intel-HP multimedia architectural team for IA-64, recently released in Intel's Itanium microprocessors.

Concurrent with full-time employment at HP, Dr. Lee also served as Consulting Professor of Electrical Engineering at Stanford University. Dr. Lee has a Ph.D. in Electrical Engineering and a M.S. in Computer Science and Computer Engineering, both from Stanford University, and an A.B. with distinction from Cornell University, where she was elected a College Scholar. She is a Fellow of the Association for Computing Machinery (ACM), a Fellow of the Institute for Electrical and Electronic Engineers (IEEE), and a member of Phi Beta Kappa and Alpha Lambda Delta. She has been granted 115 U.S. and international patents, with several patent applications pending.

P3 - Plenary Session 3: System-on-Chip

Session Chair

Howard H. Chen

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BIOGRAPHY

Dr. Howard Chen received his Ph.D. degree from the University of California, Berkeley, in 1987. Since then, he has been with the IBM Research Division, Thomas J. Watson Research Center, in Yorktown Heights, New York, where he is current a research staff member. Dr. Chen has received the IBM Invention Achievement Award for 7 U.S. patents, the IBM Research Division Award for contributions to the design and realization of the Alliance G4 microprocessor, the IBM Outstanding Contribution Award for the design and realization of the Alliance G5 microprocessor, and the IBM Research Division Award for the design and implementation of Freeway G7 microprocessor.

P3 - Plenary Session 3: System-on-Chip

Tsuhan Chen

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BIOGRAPHY

Tsuhan Chen has been with the Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, Pennsylvania, since October 1997, where he is now a Professor. He directs the Advanced Multimedia Processing Laboratory, striving to turn multimedia technologies from science fiction into reality. He also established and is the current director of the "ITRI Lab at CMU," a collaborative research laboratory sponsored by Industrial Technology Research Institute (ITRI), at one million dollars a year, with research focus on System-on-Chip (SoC) and multimedia/ security applications. His research interests include multimedia signal processing and communication, implementation of multimedia systems, multimodal biometrics, audio-visual interaction, pattern recognition, computer vision and computer graphics, bioinformatics, and building collaborative virtual environments. From August 1993 to October 1997, he worked in the Visual Communications Research Department, AT&T Bell Laboratories, Holmdel, New Jersey, and later at AT&T Labs-Research, Red Bank, New Jersey, as a senior technical staff member and then a principle technical staff member.

Tsuhan helped create the Technical Committee on Multimedia Signal Processing, as the founding chair, and the Multimedia Signal Processing Workshop, both in the IEEE Signal Processing Society. His endeavor later evolved into the founding of the IEEE Transactions on Multimedia and the IEEE International Conference on Multimedia and Expo, both joining the efforts of multiple IEEE societies. He is appointed the Editor-in-Chief for IEEE Transactions on Multimedia for 2002-2004.

Before serving as the Editor-in-Chief for IEEE Transactions on Multimedia, he also served in the Editorial Board of IEEE Signal Processing Magazine and as Associate Editor for IEEE Trans. on Circuits and Systems for Video Technology, IEEE Trans. on Image Processing, IEEE Trans. on Signal Processing, and IEEE Trans. on Multimedia. He has co-edited a book titled Advances in Multimedia: Systems, Standards, and Networks.

Tsuhan received the B.S. degree in electrical engineering from the National Taiwan University in 1987, and the M.S. and Ph.D. degrees in electrical engineering from the California Institute of Technology, Pasadena, California, in 1990 and 1993, respectively. He received the Charles Wilts Prize for outstanding independent research in Electrical Engineering leading to a Ph.D. degree at the California Institute of Technology. He has published more than a hundred of technical papers and holds fifteen U.S. patents. He is a recipient of the National Science Foundation CAREER Award, titled "Multimodal and Multimedia Signal Processing," from 2000 to 2003.

P3 - Plenary Session 3: System-on-Chip

System-on-a-Chip Synthesis

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ABSTRACT

There has been an explosive growth and interest in embedded systems in the last few years. Embedded system applications range from consumer appliances, such as microwave ovens, cellular phones and multimedia systems, to large telecom systems employing thousands of processors. Many embedded systems are portable and battery-driven. Hence, power optimization is a key consideration for them in order to prolong battery life, and alleviate thermal, packaging and reliability concerns. For the cost-conscious real-time embedded system arena, jointly optimizing system price and power under performance constraints is an important problem.

In this talk, we will first describe the relevant problems that need to be solved in system-on-a-chip (SOC) synthesis, and then describe a SOC synthesis algorithm and tool called MOCSYN, which partitions and schedules embedded system specifications to intellectual property cores in an SOC. MOCSYN synthesizes real-time single-chip hardware-software architectures using an adaptive multiobjective genetic algorithm. The use of multiobjective optimization allows a single system synthesis run to produce multiple SOC designs that trade off different architectural features. It optimizes SOC price, power consumption and area under hard real-time constraints. It solves the problem of providing clock signals to cores composing the SOC. It produces a bus structure that balances ease of layout with a reduction in bus contention. In addition, it carries out floorplan block placement within its inner loop allowing accurate estimation of global communication delays and power consumption. It is currently being commercialized by a start-up called PDV Software.

BIOGRAPHY

Niraj K. Jha received his B.Tech. degree in Electronics and Electrical Communication Engineering from Indian Institute of Technology, Kharagpur, India in 1981, M.S. degree in Electrical Engineering from S.U.N.Y. at Stony Brook, NY in 1982, and Ph.D. degree in Electrical Engineering from University of Illinois, Urbana, IL in 1985.

He is a Professor of Electrical Engineering at Princeton University. He is an IEEE Fellow and the Director of the Center for Embedded System-on-a-chip Design funded by New Jersey Commission on Science and Technology. He is currently serving as an Editor of IEEE Transactions on Computer-Aided Design, IEEE Transactions on VLSI Systems, Journal of Electronic Testing: Theory and Applications (JETTA), and Journal of Embedded Computing. He has also served as the Program Chairman of the 1992 Workshop on Fault-Tolerant Parallel and Distributed Systems. He is the recipient of the AT&T Foundation Award and the NEC Preceptorship Award for research excellence and NCR Award for teaching excellence. He has co-authored three books titled "Testing and Reliable Design of CMOS Circuits" (Kluwer, 1990), "High-Level Power Analysis and Optimization" (Kluwer, 1998), and "Testing of Digital Systems"

(Cambridge University Press, 2003). He has authored or co-authored more than 230 technical papers out of which six have won Best Paper Awards. A paper of his was also selected for the ''The Best of ICCAD: A collection of the best IEEE International Conference on Computer-Aided Design papers of the past 20 years." He has received 11 U.S. patents. His research interests include low power hardware and software design, computer-aided design of integrated circuits and systems, digital system testing and distributed computing.

P4 - Plenary Session 4: Bioinformatics

Session Chair

Sue-Jane Wang

The Statistics Representative
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BIOGRAPHY

Sue-Jane Wang has been serving as the Statistics Representative of FDA inter-center (Center for Drug Evaluation and Research, Center for Device and Radiological Health, Center for Biologics Evaluation and Research and National Center for Toxicology Research) Pharmacogenomics/ Pharmacogenetics (PG) Working Group. Her roles are twofold. One is to provide specific leadership in discussing statistical concepts/ issues of pharmacogenomics/ pharmacogenetics study design and data analysis in the multi-disciplinary expert environment. A main objective of the PG Working Group was to draft a guidance for industry on Pharmacogenetics and Pharmacogenomics: Clinical Studies and *In Vitro* Diagnostic Tests in Marketing Applications for Human Drug Products and Biologicals. The statistical consideration section of this draft guidance for industry has incorporated general principles in the statistical review of gene expression studies and genome scan DNA studies in the context of nonclinical experiments and clinical trials. As a member of the PG Working Group, Dr. Wang is currently involved in planning the second PG workshop on "Pharmacogenomics in Drug Development and Regulatory Decision-Making: The Genomic Data Submission (GDS) Proposal." The intent of the workshop is to provide a forum for more detailed discussion of the Agency's proposal and issues related to defining voluntary submission of PG data from pharmaceutical drug/ biologics/ device sponsors, the format and process for presenting such data, and the procedure for regulatory review.

She received her master degree from University of California, Los Angeles, CA and Ph.D. from University of Southern California. Dr. Wang's major research and application activities include controlled clinical trials; genetic and epidemiologic studies; statistical methods for analysis of microarray data and pharmacogenomics/ pharmacogenetics data in drug development; and teaching in biostatistics. Her professional activities include Editor-in-Chief: International Chinese Statistical Association (ICSA) Bulletin; Section Editor: Controversial Statistical Issues; Member: the Board of Directors, Publication committee and Award committee of ICSA; Chair: statistics sessions and biotechnology sessions in conferences, symposium, workshops including Pharmacogenomics Session and Genomics in Drug Discovery and Development Session at the FDA/ Industry workshop, Statistics in Genetic Epidemiology at the ICSA applied statistics symposium, Bio-Chip Technology and Data Mining session at the Symposium on Biomedical Technology Development, etc. 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.

P4 - Plenary Session 4: Bioinformatics

Large-Scale Phylogenetic Reconstruction

Tandy Warnow

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ABSTRACT

Phylogenetic trees, also known as evolutionary trees, model the evolution of biological species or genes from a common ancestor. Major advances in biology have been enabled by molecular systematics (the inference of evolution from molecular sequences), but accurate estimations of deep evolutionary histories are still difficult: data are not often sufficient in quality or quantity, and methods have not yet scaled up to handle dataset sizes such as will be needed to infer the Tree of Life. Worse still, the Tree of Life is clearly not a tree--but rather a reticulate network, due to the occurrence of speciating hybridization and horizontal transfer of genetic material. In this talk, I will discuss several of my research projects, which are collaborative with other computer scientists and biologists, and which are making some progress on these problems. In particular, I will talk about gene order phylogeny, reticulate evolution detection and representation, and large-scale phylogeny reconstruction.

BIOGRAPHY

Tandy Warnow, a full professor of Computer Science at the University of Texas at Austin, is a discrete algorithms researcher whose research focus is on the development of methods for reconstructing evolutionary history in biology and historical linguistics. A main focus of her work is the development of methods for solving hard optimization problems in large-scale phylogenetics, and she employs both theoretical methods (proving theorems about the statistical performance), as well as simulation studies, in order to predict performance of methods. Mathematical modeling is also important in her research, and these models are developed through close and long-term collaborations with domain specialists.

Warnow received both her B.A. and Ph.D. degrees in Mathematics (in 1984 and 1991, respectively) from the University of California at Berkeley; afterwards she was a postdoctoral fellow of Michael Waterman at the University of Southern California, and a researcher in the Discrete Algorithms Group at Sandia National Laboratories in Albuquerque, New Mexico. She spent several years at the University of Pennsylvania before joining the University of Texas in 1999. In addition to her primary affiliation with Computer Science, Warnow is a member of several graduate groups, including Molecular Biology, Ecology, Evolution, and Behavior, and Computational and Applied Mathematics. She is also Co-Director (with David Hillis) of the Center for Computational Biology and Bioinformatics at the University of Texas at Austin, and on the board of directors of the International Society for Computational Biology. She received the National Science Foundation Young Investigator Award in 1994, and the David and Lucile Packard Foundation award in 1996.

P4 - Plenary Session 4: Bioinformatics

Bioinformatics and Pattern Discovery at IBM

Daniel E. Platt

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ABSTRACT

Our pattern discovery efforts seek to discover patterns hidden in data, which can include time series in gene expression where levels and time delays may be present, as well as conserved patterns in gene and peptide sequences. Patterns in primary structures may be used as a vocabulary for functional and structural assignments, which may then be used to predict function and features of structure. Further, applications can be made to identify which parts of genetic sequences code for starts and stops, as well as the possibility of identifying genes.

BIOGRAPHY

Daniel E. Platt received his PhD in condensed matter theoretical physics from Emory University in 1992, and is employed at IBM T. J. Watson Research Center in the Bioinformatics and Pattern Discovery Group. His recent interests include developing the statistical side of tests of gene expression studies, as well as finding relationships between the geometric and functional information in conserved primary structure patterns.

P4 - Plenary Session 4: Bioinformatics

A Regulatory Perspective of Bioinformatics Data Generated for Pharmacogenomics and Pharmacogenetics Studies

Sue-Jane Wang,[1] Larry J. Lesko[2]

[1]The Statistics Representative, [2]Chairperson
FDA Inter-Center Pharmacogenomics/ Pharmacogenetics Working Group

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ABSTRACT

It is anticipated that bioinformatic analysis of data generated from genomic research, for example, to investigate a drug's mechanism of action, a disease subtype screening tool or a diagnostic device for a particular individual or population subtype, will become a part of the nonclinical, clinical pharmacology, and clinical trial evaluations in the foreseeable future. The bioinformatic data of particular interest are those generated from high throughput gene expression signatures, proteomics or DNA-based biomarker panels that have appropriate predictive power. The growing interest of pharmacogenomics and pharmacogenetics studies in drug development has prompted that regulatory attention be given to assessing bioinformatic data during regulatory review.

Recently, the Agency has proposed an initiative, called Genomic Data Submission, to encourage pharmaceutical drug sponsors to submit pharmacogenomic data along with bioinformatic data at an appropriate level to enable learning and the voluntary exchange of scientific information. The Agency feels that this will help advance the science and technology, and aid in the timely development of appropriate regulatory policies. In this talk, we will present the current regulatory perspective of bioinformatic data that are to be used to evaluate a pharmacologic drug effect. It should be recognized that this is an evolving field and standards and assessment approaches are likely to change with time.

BIOGRAPHY

Sue-Jane Wang has been serving as the Statistics Representative of FDA inter-center (Center for Drug Evaluation and Research, Center for Device and Radiological Health, Center for Biologics Evaluation and Research and National Center for Toxicology Research) Pharmacogenomics and Pharmacogenetics (PG) Working Group. Her roles are twofold. One is to provide specific leadership in discussing statistical concepts/ issues of pharmacogenomics/ pharmacogenetics study design and data analysis in the multi-disciplinary expert environment. Dr. Wang is currently a member of the steering committee involved in planning a second PG workshop on "Pharmacogenomics in Drug Development and Regulatory Decision-Making: The Genomic Data Submission (GDS) Proposal." The intent of the workshop is to provide a forum for more detailed discussion of the Agency's proposal and issues related to defining submission of bioinformatics data from pharmaceutical drug/ biologics/ device sponsors, the format and process for presenting such data, and the procedure for regulatory review.

Dr. Wang received 'FDA/ CDER Excellence in Communication Award' in 2000. In 2001, she and colleagues received a group award 'FDA Award of Merit' for collaborative research on flexible designs in clinical trials. Led by her, two group awards 'FDA Outstanding Service Awards' and 'FDA/ CDER Excellence in Analytical Science Award' were recognized for their scientific achievement in non-inferiority active controlled trials.

T11 - Technical Session 11: System-on-Chip (III)

Session Chair

Sao-Jie Chen

National Taiwan University

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 is currently an academic visitor at IBM TJ Watson Research Center, Yorktown Heights. 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 Association for Computing Machinery, the IEEE Computer and IEEE Circuits and Systems Societies.

T11 - Technical Session 11: System-on-Chip (III)

Overview of NTU SOC Center

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ABSTRACT

The National Taiwan University (NTU) System-on-Chip (SOC) Center is established in year 2001. The goal is to combine the research strength of NTU and industrial resources for the development of advanced SOC technologies as well as to inspire the creativity of the industry and transforming the newly developed technologies from academic research works to practical products. The ultimate goal is to make Taiwan the worldwide leader in SOC industry through such a cooperation mechanism.

NTU SOC Center has created many programs for facilitating the industrial IC companies to participate in research and educational collaborations at NTU. These relationships are highly varied, including participating in NTU seminars/ conferences/ consortia/ workshops, sponsoring research projects, monitoring research developments at NTU, finding expert consultants from among NTU faculties, licensing NTU-owned intellectual property, enhancing recruiting channel of NTU graduates and students, participating in NTU continuing and professional education programs, and developing customized research programs.

In this talk, we will introduce the details of the NTU SOC activities. Through the introduction, we can see the new collaboration model among academic university and industrial companies. With such a new university-supported mechanism, we have created a win-win working model for the development of SOC technologies in Taiwan.

BIOGRAPHY

Sy-Yen Kuo received the BS (1979) in Electrical Engineering from National Taiwan University, the MS (1982) in Electrical & Computer Engineering from the University of California at Santa Barbara, and the PhD (1987) in Computer Science from the University of Illinois at Urbana-Champaign. Since 1991 he has been with National Taiwan University, where he is currently a professor and the Chairman of Department of Electrical Engineering. He spent his sabbatical year as a visiting researcher at AT&T Labs-Research, New Jersey from 1999 to 2000. He was the Chairman of the Department of Computer Science and Information Engineering, National Dong Hwa University, Taiwan from 1995 to 1998, a faculty member in the Department of Electrical and Computer Engineering at the University of Arizona from 1988 to 1991, and an engineer at Fairchild Semiconductor and Silvar-Lisco, both in California, from 1982 to 1984. In 1989, he also worked as a summer faculty fellow at Jet Propulsion Laboratory of California Institute of Technology. His current research interests include mobile computing and networks, dependable distributed systems, software reliability, and optical WDM networks.

Professor Kuo is an IEEE Fellow. He has published more than 190 papers in journals and conferences. He received the distinguished research award (1997-2005) from the National Science Council, Taiwan. He was also a recipient of the Best Paper Award in the 1996 International Symposium on Software Reliability Engineering, the Best Paper Award in the simulation and test category at the 1986 IEEE/ ACM Design Automation Conference(DAC), the National Science Foundation's Research Initiation Award in 1989, and the IEEE/ ACM Design Automation Scholarship in 1990 and 1991.

T11 - Technical Session 11: System-on-Chip (III)

PowerHerd: A Distributed Scheme for Dynamically Satisfying Peak Power Constraints in Interconnection Networks

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ABSTRACT

As interconnection networks proliferate to a wide range of high-performance systems, power consumption is becoming a significant architectural issue. In interconnection networks, the peak power consumption directly affects the solution for package cooling and power delivery design. Off-line worst-case power analysis is typically used to estimate network peak power consumption and guarantee safe on-line operation, which not only increases system cost but also constrains network performance. In this work, we present an on-line mechanism, called PowerHerd, to efficiently manage network power resources in a distributed fashion at run-time, and guarantee that network peak power constraints are not exceeded.

Experiments demonstrate that PowerHerd can effectively regulate network power consumption, meeting peak power constraints with negligible network performance penalty. Armed with PowerHerd, network designers can focus on system performance and power optimization for the average case rather than the worst case, thus making it possible to employ a more powerful interconnection network in the system.

BIOGRAPHY

Li Shang is currently a graduate student at Princeton University's Department of Electrical and Computer Engineering. He received his B.E. and M.E. from Tsinghua University in 1997 and 1999. Li Shang's research has focused on system-level power analysis and optimization in distributed embedded systems, specialized in hardware/ software co-synthesis, power analysis and optimization of reconfigurable devices and interconnection networks. Currently, his research is in the area of power-aware interconnection networks. He received Princeton University's Wallace Memorial Honorific Fellowship. He has won the Best Paper Award at PDCS'02.

T11 - Technical Session 11: System-on-Chip (III)

Design and Implementation of a Parallel Processor IC for Job Shop Scheduling

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ABSTRACT

Job shop is a typical environment for manufacturing low-volume and high-variety discrete parts, where parts are of various due dates, priorities and sequences of production operations. Good scheduling of when to do what using which resource is critical and challenging for the competitiveness of job shops. The Lagrangian relaxation neural network (LRNN) presented by Luh et al. provides an effective solution to this problem. To further speed up the scheduling of large problems, the parallelism of the LRNN approach is exploited in this paper for hardware implementation. A parallel processor based on the SIMD architecture and its associated instruction set are designed. The architecture is implemented in a single-poly quadruple-metal 0.35-μm CMOS technology. Test results shows that the fabricated chip achieves 10 and 30 times speed-up when compared with several commercial DSP chips and a 600-MHz PC respectively.

BIOGRAPHY

Shi-Chung Chang received his B.S.E.E. degree from National Taiwan University, Taiwan, Republic of China, in 1979, and his M.S. and Ph.D. degrees in electrical and systems engineering from the University of Connecticut, Storrs, in 1983 and 1986 respectively.

From 1979 to 1981 he served as an Ensign in the Chinese Navy, Taiwan. He worked as a technical intern at the Pacific Gas and Electric Co., San Francisco, in the summer of 1985. During 1987, he was a member of the Technical Staff, decision systems section, ALPHATECH, Inc., Burlington, MA. He has been with the Electrical Engineering Department of National Taiwan University since 1988 and was promoted to Professor in 1994. During 2001-2002, he served as the Dean of Student Affairs and a Professor of Electrical Engineering, National Chi Nan University, Pu-Li, Taiwan. He is also jointly appointed by the Graduate Institute of Industrial Engineering and the Graduate Institute of Communication Engineering, National Taiwan University. His research interests include optimization theory and algorithms, production scheduling and control, high speed networks, Internet economics and distributed decision making. He has been a principal investigator and consultant to many industry and government funded projects in the above areas, and has published more than 120 technical papers. He received, in 1996, the award

of outstanding achievements in University-Industry Collaboration by Ministry of Education for his pioneering and successful research collaborations with Taiwan semiconductor industry on production scheduling and control. Dr. Chang is a member of Eta Kappa Nu and Phi Kappa Phi.

T12 - Technical Session 12: Bioinformatics (III)

Session Chair

Clive Bowman

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BIOGRAPHY

Clive Bowman C.Stat FLS is Director Population Genetics, Discovery Genetics, Genetics Research at GlaxoSmithKline. For the decade prior to joining GlaxoWellcome in 1998, Clive owned and ran specialist Clinical Research Organizations. Clive received his MSc., in Biometrics from Reading University, UK in 1985 under the guidance of Prof. Roger Mead specializing in design. In 1993 he became a Fellow of Royal Statistical Society. He has led a variety of roles in data exploration, statistics, QA, IT, pharmacokinetics and publishing . For the past five years, Clive and other GSK scientists have been leading the way in the use of high density whole genome SNP maps in the search for susceptibility genes and in pharmacogenetics.

T12 - Technical Session 12: Bioinformatics (III)

Impact of Genetic HAP Markers to Outcomes in Prospective Clinical Trials

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ABSTRACT

Genetics as basis for medicine development and patient care provision in general has been accepted as the biggest challenge facing today's healthcare industry. With the advancement of biotechnology and information technologies, the human scientific society has finished the sequencing and assembly of the complete human genome. The next obvious step will be the integration and usage of this information in the development of better diagnostics and therapeutics. The understanding of the genetic component in the interplay of the therapeutics and the disease outcome has promoted appropriately the discovery researches on the biological markers in the diverse human genetic background in association with the clinical phenotypes. At Genaissance, we have started by building the haplotype technology platform using high-throughput genomic sequencing and genotyping methodologies. The polymorphism and haplotype markers are selected and statistical associations between these markers and the clinical endpoints were studied in placebo-controlled clinical trial settings. This presentation will cover the general process and the statistics of the SNP and haplotype marker discovery, gene and marker selection in some aspects of clinical studies, clinical subject genotyping, and statistical association analysis.

BIOGRAPHY

Chuanbo Xu is currently the Senior Director of Bioinformatics at Genaissance Pharmaceuticals, Inc. New Haven, Connecticut. Prior to this position, he has been the Director and Associate Director at Genaissance. Before Genaissance, he has been a Bioinformatics Consultant for two and half years at GlaxoWellcome, Inc., now a part of GlaxoSmithKline, in RTP, North Carolina. Before that, he has been a Computational Scientist for three years at Pioneer Hi-Bred International, Des Moines, Iowa, and now a subsidiary of DuPont Corp. Chuanbo Xu's education background covers a Veterinary diploma from Jilin Agricutural University of China and a PhD in Immunology from Chinese Academy of Agricultural Sciences, and a post-doctoral research experience of 3 years at Pasteur Institute, France. He also holds a DESS degree from University of Paris V in the area of Computer Application in Life Sciences. His main expertise and interest areas cover bioinformatics and pharmacogenomics applications in drug discovery and development process, genomic and clinical data modeling, data management, relational database design, molecular and genetic data analysis, mining, visualization and data quality control, and software application development. He is the author and co-author of a number of scientific publications and gave presentations at a number of biological and bioinformatics related conferences.

T12 - Technical Session 12: Bioinformatics (III)

A novel way to find the most discriminant gene sets on Microarray

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ABSTRACT

Microarrays, a recent technology in experimental molecular biology, have been used to help the development of diagnostic tools and classification platforms in cancer research. Different approaches, including univariate and multivariate techniques, have been developed to select predictive genes in an expression dataset for classification. The univariate approaches may lose gene-gene correlated relations since they examine one gene at a time. Moreover, assumptions of homogeneity within the same class used in these methods often suffice for binary or 3-class datasets. Several multivariate approaches, which identifying genes that jointly discriminate between multi-classes of samples, overcome above drawbacks but may over fit to some kind of objectives by using a particular classifier directly as criteria for goodness of gene sets. Furthermore, such systems contain many parameter adjustments to get better results.

We proposed a genetic algorithm based approach, combining univariate and multivariate techniques, use Gamma test [Stefansson *et. al.*, 1997] and Pearson correlation as evaluation functions to find optimal gene sets with minimum size for sample classification on gene expression data automatically and unbiased. Our approach can be divided into two steps: (1) preprocessing by Threshold Number of Misclassification (TNoM) and permutation tests to filter out genes with non-informative patterns between classes, and (2) using a multi-objective genetic algorithm to find subsets of significant genes derived from step 1 with lower correlation within gene patterns and higher correlation to classes. The GA in Step 2 has two major mechanisms to help local and global searches, including heterogeneous pairing selection (HpS) and family competition. The objective function contains two parts, which minimize the sum of these two scores: (1) Gamma test gives a data-derived estimate for the mean-squared error of classification, but not a classifier actually; (2) Pearson correlation is used to get a gene sets with smaller size and complement patterns.

We use the classification accuracy of K-nearest neighbor classifier and leave-one-out cross-validation to evaluate our performance. In our preliminary study for Colon cancer dataset, we get 56 genes remained after the filtering step and 8 of them to be the final predictive set. The classification accuracy is 95% when K = 3 and using a majority rule.

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BIOGRAPHY

Cheng-Yan Kao was born in Taipei, Taiwan, 1948. He received B.S. in mathematics from National Taiwan University, Taipei, Taiwan, in 1971, and the M.S. degree in computer science in 1976, the M.S. degree in statistics in 1978, and the Ph.D. degree in computer science in 1981, all from the University of Wisconsin-Madison.

He worked for Ford Aerospace, the Unisys Corporation, and worked for General Electric from 1980 to 1989 at the Johnson Space Center, NASA, Houston, TX. He has been a professor with

the Department of Computer Science and Information Engineering, National Taiwan University since 1990. He has published more than 40 technical papers in various journals and international conferences. His research interests include bioinformatics, biochip, evolutionary computation, optimization, and grid computing. He has been the president of Bioinformatics Society Taiwan since 2000.

T12 - Technical Session 12: Bioinformatics (III)

A Novel Pattern Recognition for Microarray Data Analysis

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ABSTRACT

DNA microarray technology enables investigating the expression of thousands of genes in a single experiment. Accurate analysis and meaningful interpretation of massive information from this technology pose a unique challenge. Classification using the pattern recognition methods can be used to predict disease type and/ or stage and chemical-induced toxicity based on the gene expression data from microarray experiments, and is promising for correlation of genotype with phenotype. Classification models are developed in two steps: construction and validation. Most classification models based on microarray data in the literature are developed by first selecting a small subset of genes from among the large set of genes on microarray. The same subset of genes is then used in both model development and validation steps, such that errors associated in gene selection are not part of validation. In this presentation, a novel classification method, named Decision Forest is presented, which combines the gene selection and model construction into a single step. The method offers a number of advantages over traditional classification approaches. More specifically, the cross-validation result of Decision Forest that integrates gene selection with model development provides better indication to the quality of a classification model.

BIOGRAPHY

Dr. Huixiao Hong received his Ph.D. in Computational Chemistry from Nanjing University in China in 1990. Following postdoctoral research at Maxwell Institute for Molecular Sciences in Leeds University in U.K. from 1990 to 1992, he was associate professor of computational chemistry at Nanjing University in China from 1992 to 1995. Dr Hong joined Dr. Milne's research group at the National Cancer Institute at National Institutes of Health as a visiting scientist in 1995. In 1998, he moved to Somitumo Chemical Co. Ltd. in Japan as a research scientist. In 2000, he joined an on-site IT contractor at the FDA's NCTR to develop chemoinformatics approaches for managing and predicting hormone-related and endocrine-disrupting compounds. He then became Manager of the Bioinformatics Laboratory to develop computational toxicology methods and bioinformatics approaches for genomic, proteomic and metabonomic research as well as traditional toxicological studies at NCTR. Dr. Hong has published over 50 research papers and holds 3 US and Japanese patents.

T13 - Technical Session 13: C4I (III): Multi-Service Communications

Session Chair

Yih-Kang Maurice Lin

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BIOGRAPHY

Yih-Kang Maurice Lin received the B.S. physics from National Central University, Taiwan in 1974, M.S. physics from University of Kansas in 1979, and M.S. information & computer science from Georgia Tech in 1980 and Ph.D. electrical engineering from UCLA in 1988.

Dr. Lin is currently a District Manager at AT&T Labs and responsible for certification of high-speed Ethernet metro services and Ethernet access to AT&T data and IP networks. He is also responsible for certifying access technologies – such as DSL, VSAT - for access to AT&T data packet networks. Prior to this, he was managing the ATM integration test district and responsible for identifying and testing emerging access technologies to AT&T local and long-distance ATM networks. His district also provided with time to market service development support for AT&T Latin America and UNISITI (AT&T China joint venture) to deploy the networks and launch the services in a very short time frame.

Dr. Lin joined AT&T Bell Laboratories in 1994 as a member of technical staff and led a test team to certify AT&T ATM network and services. From 1988 to 1994, he joined Bellcore as a member of technical staff and worked on various projects, including fiber to the home, SMDS and ATM. From 1980 to 1983, he worked for Gearhart Industries in Dallas, Texas as a software engineer.

T13 - Technical Session 13: C4I (III): Multi-Service Communications

Network Convergence

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ABSTRACT

With the telecommunications industry collapsing, the survivors will be the service providers who can provide legacy and new emerging services in a cost effective manner. Two areas are fundamental in achieving these costs – collapsing the multitude of networks onto one common architecture/ network and automating operations processes for zero human touch. While these sound very basic, the challenge is to take the many vendor products, which focus on only one particular service and make the architecture appear as one seamless network. The challenge is to take the many vendor network management systems and to fully automate from the customer request, whether it is provisioning, billing or fault management, to the appropriate commands executed at the downstream equipment. This talk will go through these concepts and the challenges to achieve these concepts.

BIOGRAPHY

Margaret Chiosi, Packet Services Certification Division Head, has been in the data communications world for 25+ years. Her experience has ranged from deployment of emerging network technologies for new data services, to development of data networking equipment, to strategic direction for data services and products. Data experience has ranged from IP/ VPNs to FR/ ATM to SNA/ X.25. She currently leads a technical team responsible for certification and deployment of all the AT&T packet network services – FR, ATM, IP. These services account for more than 50% of AT&T's business revenues (over $4B) with the other revenues coming from private line services. Margaret has received her masters/ bachelors in Computer Science from Purdue University.

T13 - Technical Session 13: C4I (III): Multi-Service Communications

Future Evolution in Local Access Technology and Telephony Services

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BIOGRAPHY

Irwin Gerszberg is Division Manager of the Advanced Local Network Access Technology Organization for AT&T Local Services in Florham Park, NJ. His organization is responsible for all "Last Mile" Access Technologies for the AT&T Local Services Network.

He holds a Bachelor's degree in Electrical Engineering and a Master's in Computer Science from NJIT and Stevens Institute of Technology. He joined the AT&T Bell System in 1978. While at Bell Laboratories, he managed large software projects for the RBOC's in advanced operations and testing of the local exchange network. In 1985, he spearheaded one of AT&T's first Speech Response/ Voice Recognition Trials with the RBOC's. After joining AT&T's Wireless unit in 1989, he was responsible for the development of numerous advanced wireless technology services.

He holds over 70 Patents on Local Access Technology covering DSL, Voice over DSL, IP, Cable telephony, Broadband Wireless, CD quality IP telephony & a vast array of emerging Broadband infrastructure and services with the United States Patent office. These contributions earned him AT&T's Science and Technology Medal in 2001. In February of 2002, he was awarded "New Jersey Inventor of the Year" by the State of N.J. and inducted into the N.J. Inventors hall of congress for his innovations and contributions to science and technology in the telecommunications industry.

Irwin is quoted as an industry expert and visionary in numerous telephony articles in the Wall Street Journal, Newsweek, Starledger, Daily Record, Home News, Telephony Magazine, etc. and has provided testimony at numerous FCC Hearings on telecommunication policy.

He is a member of the NJ Technology Counsel, Association of Public-Safety Communication Officials, Society of Cable Telecommunications Engineers, and IEEE. He is a lifetime resident of New Jersey and lives in Kendall Park with his wife Sherry and their two children.

T13 - Technical Session 13: C4I (III): Multi-Service Communications

Autonomic Management of Multi-service Computing Utilities

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ABSTRACT

Computing utility or utility computing is considered to be the emerging service model for the internet and e-business. Under this model, customers use system infrastructure and associated resources such as network bandwidth and processor cycles as "utilities" similar to telephony and electricity. The service organizations often offer multiple service plans, and in term will serve and bill customers according to services they subscribe to.

Management of such computing utilities is very complex due to the needs in: monitoring and enforcement of service quality based on customer service plans, and configurations of varieties of heterogeneous computing resources. In particular, most of the underlying system infrastructures of computing utilities consist of an array of network devices including switches, routers, firewall, load balancers. The tasks to establish specific network connectivity and access required by business policies and security rules can be daunting for administrators. Thus, it is essential that computing utilities are built with autonomic management capability such that these systems can be self-optimizing, self-configuring, self-recovery, and self-protecting, similar to the autonomic capability of human nervous system in response to external stimuli. Moreover, individual utility resources such that network devices would eventually have build-in autonomic management capabilities.

BIOGRAPHY

Liana L. Fong joined IBM T. J. Watson Research Center in 1985 as a research staff. Her research activities have been in the areas of operating system structures, system management and performance evaluation for computer architectures ranging from mainframe, to workstation, and to very large network of systems for scientific high performance computing. In addition to her research activities, Liana also involves in technology transfer to IBM product divisions, and carries out proof of concept engagements with IBM large customer accounts.

In recently years, Liana has concentrated on building technologies related "on demand" and "autonomic" computing initiatives. She was one of the lead developers for Oceano, an IBM first research prototype that supported SLA based auto-provisioning of network and servers in multi-service computing farms. She has also worked closely with IBM Global Services on e-business technologies for web hosting data centers. Her currently research focus is on demand resource scheduling and auto-provisioning.

T13 - Technical Session 13: C4I (III): Multi-Service Communications

Network based VPN Services – MPLS VPN

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ABSTRACT

Wide Area Network (WAN) service market has seen evolution from legacy data services (Private Line, Frame Relay and ATM) to the next generation IP based VPN services in the recent years. Many Service Providers (SP) around the world have been deploying MPLS technology in their networks so that they can offer network based IP VPN to businesses. With MPLS enabled network, Service Providers are able to offer cost effective and converged VPN services that support business's needs for intranet, remote access and extranet as well as data, voice and video applications. MPLS IP VPN will be one of high growth services in the communications market in the next five years.

This presentation will first examine VPN implementation and look into the VPN market trend. With an introduction of MPLS technology, this presentation will provide overview of how MPLS technology works in IP network, what role of MPLS plays in convergence and what benefits of MPLS IP VPN can be brought to businesses. Finally the presentation concludes that MPLS is one of key next generation technologies that enable network convergence and network based on VPN services based on MPLS and IP will see wide adoption by businesses in the near future.

BIOGRAPHY

Luyuan Fang is a Principal Technical Staff Member in the Global IP Network Architecture Design organization at AT&T Labs. She is directly responsible for the design and engineering of MPLS technology in the AT&T IP backbone. Dr. Fang is the lead architect for several AT&T MPLS IP VPN product deployments, and plays a key role in technical realization of MPLS IP VPN service features in the AT&T IP network. In addition to her MPLS VPN activities, Dr. Fang is involved in evaluating forward-looking network technologies and equipment capabilities to support emerging services. Prior to her current position, Dr. Fang was responsible for the design and deployment of AT&T International Frame Relay Services, including global ATM-Frame Relay Interworking.

Prior to joining AT&T, Dr. Fang held various research positions in Artificial Intelligence and data networking in Telstra, Nortel, and Racal Datacom.

Dr. Fang has extensive experiences in MPLS technology and IP/ data networking. She is very active in IETF, where she is currently co-authoring several Internet Drafts and RFCs in the MPLS, PPVPN and Traffic Engineering Working Groups. She is a frequently invited speaker at leading international conferences on MPLS technology and VPN deployment. She has given several tutorials on MPLS and VPN technologies in IEEE conferences and other MPLS events, and has published more than 40 technical papers.

Dr. Fang holds a Ph.D. in Computer Science from the Flinders University of South Australia, an M.S. in Computer Science from Brigham Young University, Utah, and a B.S. in Physics from Jiangxi University, China.

T14 - Technical Session 14: C4I (IV): Information and Knowledge Management

Session Chair

Zon-Yin Shae

IBM T. J. Watson Research Center

BIOGRAPHY

Zon-Yin Shae is at the IBM Watson Research Center, where he works in the area of VoIP, SIP, multimedia streaming, media enabling e-business applications and the use of multimedia to bridge physical and virtual environments. He led IBM multimedia streaming project used for the Atlanta Olympic Game. He is currently working on the VoIP/ SIP converged enterprise applications, infrastructure and services.

Dr. Shae received the B.S. and M.S. degrees in electronic engineering from the National Chiao-Tung University, Taiwan, 1976 and 1978 respectively, and the Ph.D. degree in electrical engineering from the University of Pennsylvania, Philadelphia, USA, 1989. From 1980 to 1984, before he pursued his Ph.D. degree, he worked as an engineer in the areas of communication system and microprogramming CPU design for signal processing. Since March 1989, he has been with IBM Watson Research Center, New York. Dr. Shae has published tens of technical papers and applied tens U.S. patents. He has received various awards from IBM Watson Research Center for his contributions in the area of multimedia communication.

T14 - Technical Session 14: C4I (IV): Information and Knowledge Management

On Visual Similarity Based 3D Model Retrieval

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ABSTRACT

A large number of 3D models are created and available on the Web, since more and more 3D modelling and digitizing tools are developed for ever increasing applications. The techniques for content-based 3D model retrieval then become necessary. In this paper, a visual similarity-based 3D model retrieval system is proposed. This approach measures the similarity among 3D models by visual similarity, and the main idea is that if two 3D models are similar, they also look similar from all viewing angles. Therefore, one hundred orthogonal projections of an object, excluding symmetry, are encoded both by Zernike moments and Fourier descriptors as features for later retrieval. The visual similarity-based approach is robust against similarity transformation, noise, model degeneracy etc., and provides 42%, 94% and 25% better performance (precision-recall evaluation diagram) than three other competing approaches: (1)the spherical harmonics approach developed by Funkhouser et al., (2)the MPEG-7 Shape 3D descriptors, and (3)the MPEG-7 Multiple View Descriptor. The proposed system is on the Web for practical trial use (http://3d.csie.ntu.edu.tw), and the database contains more than 10,000 publicly available 3D models collected from WWW pages. Furthermore, a user friendly interface is provided to retrieve 3D models by drawing 2D shapes. The retrieval is fast enough on a server with Pentium IV 2.4GHz CPU, and it takes about 2 seconds and 0.1 seconds for querying directly by a 3D model and by hand drawn 2D shapes, respectively.

BIOGRAPHY

Ming Ouhyoung received the BS and MS degree in electrical engineering from the National Taiwan University, Taipei, in 1981 and 1985, respectively. He received the Ph.D degree in computer science from the university of North Carolina at Chapel Hill in Jan., 1990. He was a member of the technical staff at AT&T Bell Laboratories, Middle-town, during 1990 and 1991. Since August 1991, he has been an associate professor in the department of Computer Science and Information Engineering, National Taiwan University. Then since August 1995, he became a professor. He was the Director of the Center of Excellence for Research in Computer Systems, College of Engineering, from August 1998 to July 2000, and was the Chairman of the Dept. of CSIE from August 2000 to July 2002. He has published over 100 technical papers on computer graphics, virtual reality, and multimedia systems. He is a member of ACM and IEEE.

Ming is currently on sabbatical leave, and is a visiting fellow at the Dept. of Computer Science, Princeton University. He collaborates with Professor Thomas Funkhouser in Graphics and Computational Geometry Group at Princeton.

T14 - Technical Session 14: C4I (IV): Information and Knowledge Management

E-Commerce Value Chain Business Transformation

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ABSTRACT

This talk covers experiences learned in the e-commerce value chain constructions, with respect to business process management and various data feed integrations. In addition to commerce stores, we will address fulfillment, which supports from quote to cash. We will discuss information integration methodology used in the current value chains, and problem opportunities in areas such as data quality, duplication, propagation delay, transformation, the handling of large documents, and so on. The talk presents solutions using a Websphere Business Integration clustering technique and enhancements in WBI adapters for active persistent streaming data operations. A cut-through method using a "double data schema annotation" technique is to be discussed on how data is handled and manipulated amongst applications, operational data store, and collaboration brokers.

BIOGRAPHY

Dr. Jih-Shyr Yih is native to Taiwan, received educations in US with doctoral degree from U. Michigan, 1990, has afterward worked in IBM Watson Research, and is currently managing the e-commerce architecture dept. He has taken on assignments to IBM divisions, for internet groupware development in White Plains, and for banking solution development in Copenhagen. Dr. Yih conducts basic technology research as well as engages in commercial commerce solutions and IBM's own value chains transformation. He is most interested in working on real world business problems and providing feedbacks for product development.

T14 - Technical Session 14: C4I (IV): Information and Knowledge Management

Privacy Protection on Information Management

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ABSTRACT

The emergence of new technology on information capturing, integration, analysis, and dissemination enables more information sharing and usage. However, it also causes significant concerns for information abuse. Unless addressed early in the design, security and privacy can be a serious obstacle to the rapid adoption to those new technologies. Identifying new challenges and developing technology on security and privacy to create on-demand assurance is critical. In this talk, I will discuss the problems of privacy protection for information sharing, review some existing privacy technologies, and identify new challenges that need to be addressed to enable new information integration infrastructure.

BIOGRAPHY

Dr. Xuan Liu is a research staff member at IBM T.J. Watson Research Center. She received her PhD in Computer Science from University Of Minnesota, Minneapolis. Her current research interests include privacy technologies for information sharing and business process, XML technologies, location-based services, data mining, and spatial databases. She has published many papers in referred journals and international conferences. One of her papers presented at sixth international symposium of ACMGIS was among the best papers. Her research work has resulted into five patents filed, and also been incorporated into IBM products, or released as IBM Web services toolkit on alphaworks. Dr. Liu has been invited to review papers for various international journals and conferences and invited to give presentations on various conferences, universities and corporations. She has served as a program committee member for many international conferences. She is a member of IEEE and ACM.

T14 - Technical Session 14: C4I (IV): Information and Knowledge Management

From Information to Business Process Management

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ABSTRACT

Information management is the means by which an organization maximize the efficiency with which it plans, collects, organizes, uses, controls, disseminates and disposes information and through which it ensures that the value of information is identified and exploited to the full extent. However, the true benefits of an information lifecycle management system can not be realized without implementing applications and workflows that provide the access to each information source. Both applications and workflows will become unmanageable if one does not manage the business processes behind them. In this talk, we will first present the efficiency and the effectiveness problems associated with most information systems today and how we can resolve such problems by redesigning a new enterprise information architecture and implementing a new middleware layer.

BIOGRAPHY

Shih-Ping Liou was born in Tainan, Taiwan, Republic of China, in 1961 and graduated in information engineering from National Taiwan University in 1983. He received the M.S. and Ph.D. degree in computer science and engineering from the University of Michigan, Ann Arbor, in 1986 and 1990. From September 1990 to November 1992, he was a project engineer in Zexel Technologies, Inc., developing in-vehicle navigation systems. In 1992, Dr. Liou joint Siemens Corporate Research, Princeton, New Jersey, where he is currently a program manager, responsible for the research and development of technology as well as process methodology related to information lifecycle management. His experience spreads across a wide range of business and technology areas, including strategic alliance, business development, quality improvement, six sigma, program/project management, information architecture, network protocols, quality of service, multimedia messaging and collaboration, multimedia summary generation, multimedia indexing/retrieval, medical imaging, 3D visualization, distributed computing, and computer vision.

Dr. Liou has published in various journals and conference proceedings and is a member of the ACM and IEEE. He holds six US patents with many more under review and has published more than 30 papers on leading journals and conferences in a wide range of business and technology fields. He also serves on the Editorial Board of Machine Vision and Applications.

T15 - Technical Session 15: System-on-Chip (IV)

Session Chair

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BIOGRAPHY

Michael S. Hsiao received the B.S. in Computer Engineering with highest honors from the University of Illinois at Urbana-Champaign in 1992, and M.S. and Ph.D. in Electrical Engineering in 1993 and 1997, respectively, from the same university. During his studies, he was recipient of the Digital Equipment Corp. Fellowship, McDonnell Douglas Scholarship, and Semiconductor Research Corp. Research Assistantship. Between 1997 and 2001, Dr. Hsiao was an Assistant Professor in the Department of Electrical and Computer Engineering at Rutgers University. Since 2001, he has been an Associate Professor in the Department of Electrical and Computer Engineering at Virginia Tech. He was a visiting scientist at NEC USA in Princeton, NJ, during the summer of 1997, and he was a visiting faculty at Intel Corporation in the summer of 2002.

Michael is a recipient of the National Science Foundation CAREER Award, and he has published more than 80 refereed journal and conference papers. His current research focuses on SOC testing, verification, diagnosis, and power management.

T15 - Technical Session 15: System-on-Chip (IV)

LOW-COMPLEXITY/ HIGH-SPEED FORWARD ERROR CORRECTION ARCHITECTURE FOR OPTICAL COMMUNICATIONS

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ABSTRACT

The use of Forward Error Correction (FEC) in optical communications was pioneered for submarine systems where detection and correction of errors was critical for transmission over very long haul networks. Out of many error correction codes, Reed-Solomon (RS) codes have been widely used in a variety of communication systems such as space communication link, digital subscriber loops, and wireless systems as well as in networking communications. However, as data rates reach 40 *Gb/s* and beyond, the power consumption and complexity of FEC devices are the main barrier to integrate them into optical communication systems at a low cost. We present the design and implementation of low-complexity/ high-speed FEC architecture for high-speed fiber optic communication systems, and especially present the key ideas applied to the design of RS decoder blocks for achieving high throughput and reducing complexity.

BIOGRAPHY

Dr. Hanho Lee received Ph.D. and M.S. degrees, both in Electrical & Computer Engineering, from the University of Minnesota, Minneapolis, in 2000 and 1996 respectively, and a B.S. degree in Electronics Engineering from Chungbuk National University, S. Korea, in 1993. In 1999, he was a Research Consultant at Lucent Technologies, Bell Labs, Holmdel. From April 2000 to August 2002, he was a Member of Technical Staff at the Lucent Technologies (Bell Labs Innovations), Allentown, where he was responsible for the development of high-performance digital signal processor architecture for next-generation wireless communication systems. Since August 2002, he is with the Department of Electrical and Computer Engineering, University of Connecticut, where he is presently an Assistant Professor. His research interests include the digital VLSI circuits and systems design for communications and computers, System-on-a-Chip (SoC) design, and VLSI signal processing.

T15 - Technical Session 15: System-on-Chip (IV)

Testing High-Frequency Serial Communication Interfaces in the SoCs

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ABSTRACT

As pointed out in the International Technology Roadmap for Semiconductor, we are in urgent need for a testing solution for the high-frequency serial communication interfaces. Serializer/deserializer (SerDes) IP cores running at up to 10Gb/s are common and are quickly populated the SoC ASICs in great number. Most SerDes do equipped with built-in self-test (BIST); however, these are for loop-back functional test only. The real crucial jitter and jitter tolerance for BER (bit-error-rate) tests are left for the external ATE. However, ATEs are having difficult time to catch up the speed of SerDes (40-56Gb/s has been demonstrated); and the sheer number of SerDes in a SoC is simply too large (150 SerDes on a single SoC ASIC) to be handled cost effectively. Therefore, we believe the solution should come as a BIST for SerDes that is capable of jitter and jitter tolerance testing.

Three major research problems can readily be identified: (1) can we measure sub-pico-second jitter on-chip? (2) can the jitter BIST tolerate the process variability? and (3) can we minimize the impact to the performance of SerDes? Essentially, the traditional method of signal acquisition will not work for this problem, as the requirement for an extremely high-speed gold reference signal is impossible. We have recent proposed a new measurement circuit design in which pico-second range jitter can be measured on-chip with lower frequency reference signal. We believe this design has promising features to answer the above questions and be a core building block for the jitter BIST for high-frequency SerDes in SoC.

BIOGRAPHY

Jien-Chung Lo graduated from Taipei Institute of Technology, majoring in Electronic Engineering, in 1981. He received his M.S. and Ph.D., both in Computer Engineering, from the University of Southwestern Louisiana, Lafayette, Louisiana, in 1987 and 1989, respectively. He joined the University of Rhode Island in 1989 and is currently a Professor at the Department of Electrical and Computer Engineering. In 1996, he was a visiting research professor at the Tokyo Institute of Technology.

He served as the General Chair of the IEEE 8th North Atlantic Test Workshop, West Greenwich, RI, May 1999. He was the General Co-Chair of the IEEE Symposium on Defect and Fault Tolerance in VLSI Systems, California, October 2001, and the Program Chair for its 2000 meeting. He is currently served on the program and steering committees of several conferences and workshops. He served as guest editor for the Journal of System Architecture, Elsevier Pub., in 2002. He is currently an Associate Editor of IEEE Transactions on Computers. His current

research interests include: Reliable logic circuit synthesis, timing measurement and mixed-signal modeling and testing. Dr. Lo is a senior member of IEEE Computer Society.

T15 - Technical Session 15: System-on-Chip (IV)

Constrained Transition Fault ATPG to Reduce Yield Loss in SOCs

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ABSTRACT

Higher clock rates, shrinking geometries, longer wires, and increased density are making modern SOC designs more vulnerable to speed-related failures. At-speed AC testing (such as Broadside testing) has been widely used in industry to detect such delay-induced defects. However, with scan-based testing methods, many path-delay and transition faults that require illegal (or unreachable) states will be targeted through the initial scan-in state. As a result, unnecessarily large number of functionally impossible delay-related faults is tested, and such practices over-exercise the chip, which may result in potential yield loss and large test volume.

In this presentation, we propose a new concept of testing only functionally testable transition faults in Broadside transition testing via a novel constrained ATPG. For each functionally untestable transition fault f, a set of illegal (unreachable) states that enable detection of f is first computed. This set of undesirable illegal states is efficiently represented as a Boolean formula. Our constrained ATPG then incorporates this constraint formula to generate Broadside vectors that avoid those undesirable states. In doing so, our method efficiently generates a test set for functionally testable transition faults and minimizes detection of functionally untestable transition faults. Because we want to avoid launching and propagating transitions in the circuit that are not possible in the functional mode, a direct benefit of our method is the reduction of yield loss due to overtesting of these functionally untestable transitions.

BIOGRAPHY

Xiao Liu received his B.S. and M. S. in Electrical Engineering, both from Huazhong University of Science and Technology, China. He had been studying in the Department of Electrical and Computer Engineering at Rutgers University, NJ from 1999 to 2001. He transferred to Virginia Tech with Dr. Michael S. Hsiao on 2001 and currently is a post-qualify Ph.D candidate in Bradley Department of Electrical and Computer Engineering. Now, he is doing co-op in the System LSI Department of NEC Laboratories, America on delay testing.

He has been working on the ATPG, DFT and compaction for transition fault testing in the last three years and his current research interests include transition fault testing, delay testing and timing verification.

T15 - Technical Session 15: System-on-Chip (IV)

Open Architecture ATE: Software Considerations

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ABSTRACT

Today, the ATE (Automated Test Equipment) industry is facing a technological revolution, in which a new Open Architecture ATE is emerging, which is competing with and will eventually replace traditional ATE. This new concept of Open Architecture ATE is becoming a very hot topic that is being discussed in the industry. In order to define the new open architecture ATE to solve the challenges of cost-effectively testing complex semiconductor devices including System-on-Chips (SoCs), System-in-Packages (SiPs) and other complicated devices, the Semiconductor Test Consortium (STC), Inc., an industry-wide initiative, is formed among ATE users, ATE vendors, and module vendors. The STC is now defining the specification of the Open Semiconductor Test Architecture — OPENSTAR™ and has released the first draft of the specification.

The OPENSTAR™ test platform provides reconfigurability and scalability to be capable of coping with various test requirements and preventing tester obsolescence. The OPENSTAR™ system architecture provides support for multiple hardware implementations and can be conceptually envisioned as a distributed system. Each test site is envisioned as dedicated to testing a single device under test (DUT), and functions through a configurable collection of test modules. Each test module is an entity that performs a particular tester function. For example, a test module could be a device power supply, a pin card, an analog card, etc. This modular approach provides a high degree of flexibility and configurability. For example, a collection of sixteen 64-pin modules could be configured into eight test sites to serve as separate, independent units to test eight separate 128 pin-count DUTs, or into two test sites for two 512 pin-count DUTs, or one site for a 1024 pin-count DUT.

In each configuration, the test site is under the control of a single Site Controller. Each type of test module supports a particular, standard interface that enables the Site Controller to communicate with it. This standardization of the communications interface, as well as inter-module communications and connectivity to chassis allows for a high degree of plug-and-play between conforming modules from different vendors. Each Site Controller could be deployed on its own dedicated CPU, or as a separate process sharing the same CPU with the System Controller and/or other Site Controllers. The communication between a Site Controller and a module-set could be provided by a variety of connectivity enabling hardware, as long as it serves as a high-speed bus for fast data transfer (for loading pattern data, gathering response data, and providing control, etc.).

This architecture allows for unhindered scaling up as per-site test complexity increases, or the number of independent test sites increases. The central System Controller, with limited responsibilities for test station functionality, is not as taxed as in a system where the central System Controller has responsibilities for managing all test site functions. With most of the test

station functionality being relegated to the Site Controllers — thus allowing independent test site operation — the System Controller serves as the overall system manager. This coordinates the Site Controller activities, manages system-level parallel test strategies, and provides for handler/ probe controls as well as system-level datalogging and error handling support.

The OPENSTAR™ Software project is aimed at delivering a modular ATE solution that scales well and is extremely flexible. The OPENSTAR™ Tester Operating System (TOS) software is a distributed system that has components deployed across the System Controller and the Site Controllers. The TOS has two principal operating modes: online and offline. The former implies actual tester hardware, while the latter provides system hardware emulation.

The System Controller software is the primary point of interaction for a test engineer in verification and/ or debug environment. It provides the gateway to the Site Controllers, and synchronization of the Site Controllers in a multi-site/ DUT environment. User applications and tools — graphical user interface (GUI)-based or otherwise — run on the System Controller. The System Controller could also act as the repository for all test plan related information, including compiled test plans, compiled patterns, test conditions or parameters files, etc.

The OPENSTAR™ Software supports tester configurations with Site Controllers being responsible for running one or more DUTs, i.e., test sites. Hence, in a system comprising multiple Site Controllers, each Site Controller controls testing of one or more DUTs, executing the test engineer's test programs. For each site it controls, it provides high-level synchronization of the test modules corresponding to the DUT. It is important to note here that one should not equate a test site with a Site Controller. A single Site Controller can control one or more test sites, and purely from a software architecture point of view, there is no restriction on the number of sites controlled by a single Site Controller (apart from usual computer system resource considerations).

The Modules provide hardware components to support device testing, such as digital tester channels, device power supplies, or parametric measurement units. Module software controls a particular instrument hardware module.

The OPENSTAR™ architecture allows ATE developers and hardware and software module developers to concentrate on developing new test solutions and innovating breakthrough technologies for our industry. OPENSTAR™ provides a practical solution for the semiconductor industry to timely offer diversities of required testing functions, prolong the life of ATE, and eventually solve the challenges of cost-effectively testing complex semiconductor devices including SoCs, SiPs and other complicated devices.

BIOGRAPHY

Yuhai Ma received his B.S. degree in Computer Engineering from the Department of Computer Engineering at Shandong Polytechnic University in Jinan, China in 1987, and Ph.D. degree in Computer Engineering from the Institute of Computing Technology at Chinese Academy of Sciences in Beijing, China in 1995. From 1987 to 1992, he taught in the Department of Mathematics at Qufu Teachers University in Shandong, China. From 1995 to 1997, he pursued his post-doctoral research program in Electronics and Communication in the Institute of Microelectronics at Tsinghua University in Beijing, China.

Dr. Ma is with Advantest America, Inc. He serves on the technical program committee for the IEEE North Atlantic Test Workshop (NATW) from 1999 to 2003. Dr. Ma is a member of the IEEE and the IEEE Computer Society, and he is also a member of the Semiconductor Test Consortium (STC), Inc. His research interests include Open Architecture ATE, Software Engineering, ATE Software, and VLSI Testing.

T16 - Technical Session 16: Bioinformatics (IV)

Session Chair

Simon Lin

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BIOGRAPHY

Dr. Simon Lin is the technical manager of the bioinformatics core facility at Duke University Medical Center since 1999. He was appointed as a research assistant professor since 2002. His research interest includes medical genomics data mining and knowledge discovery. He edited three books on Microarray Data Analysis. Besides research, he is teaching Genome Informatics, a new course in the Ph.D. program of Bioinformatics.

Dr. Lin received his M.D. degree from the medical scientist training program at Peking University School of Medicine in 1996; and his M.S. degree in molecular biophysics from University of North Carolina at Chapel Hill in 1999.

In the 80s, he was a lead software engineer in the Golden Apple software development team. Products focused on icon-based multilingual and multimedia operating system running on Rockwell 6500 CPUs, including Apple II, Commodore 64, and CEC computers. In the 90s, he developed interests in medical informatics. His dissertation project was a bioinformatics study on mRNA structures. It resulted in a computer program to optimize protein production for biopharmaceutical industry. During his training in biophysics at the University of North Carolina at Chapel Hill, he developed a high-throughput drug screening assay and discovered a novel activator of a calcium channel by computational chemistry.

He is the founding chair of an annual international conference on the Critical Assessment of Microarray Data Analysis (CAMDA). He is on the scientific committee of ACM BioKDD workshops, and the Atlantic Symposium on Computational Biology. He is also on the board of the Association of Chinese Bioinformaticians (ACBIX), a non-profit organization registered in the State of Pennsylvania to promote career development for Chinese bioinformatics professionals.

T16 - Technical Session 16: Bininformatics (IV)

An Integrated Bioinformatics Approach for Proteomic Expression Analysis of Clinical Samples and Its Application to Biomarker Discovery

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ABSTRACT

Advances in high-throughput expression analysis technologies have made it possible to simultaneously measure and create a profile of the expression levels of a large number of genes or proteins from a single biological sample. When applied to clinical specimens, such expression profiling technologies offer promising opportunities for the discovery of new diagnostic markers and therapeutics targets. However, the processing and analysis of high-dimensional expression profiling data from clinical samples are very different from those on data from biological samples obtained under controlled experimental conditions. An appropriate bioinformatics approach requires the integration of (1) statistically sound study designs, (2) computational methods that maximize the use of information from limited samples while alleviating the impact of non-disease related variability and biases, and most importantly, (3) clinical and biological knowledge about the disease processes. The main goal of research at the Biomarker Discovery Center is to discover and validate tumor markers for the early detection of a number of major cancers using protein expression profiling of clinical samples. Currently most of our profiling data have been obtained using Surface-Enhanced Laser Desorption and Ionization (SELDI) Time-of-flight Mass Spectrometers (TOF-MS). The talk will be divided into three parts. The first part describes the general process of biomarker discovery and validation for clinical applications and how it imposes a number of special requirements on bioinformatics approaches. The second part introduces the basic concept of a supervised learning algorithm called Unified Maximum Separability Analysis (UMSA) that we developed for the analysis of high-dimensional data. By combining the traditional distribution-based statistical classification methods with the empirical risk minimization method of Support Vector Machine (SVM), UMSA is particularly suitable for the analysis of high-dimensional expression profiling data from a relatively small number of clinical samples. Finally, the third part presents a large-scale multi-center study recently completed at the Biomarker Discovery Center for the early detection of ovarian cancer. The processes involved in study design and data analysis exemplify the issues and proposed approaches discussed in the first two parts.

BIOGRAPHY

Zhen Zhang is currently an associate professor in the Department of Pathology at Johns Hopkins University School of Medicine and associate director of the Biomarker Discovery Center. Prior to joining Johns Hopkins, he had been a faculty member at the Medical University of South Carolina in Charleston, SC for fourteen years. During 1994 - 2002, he was also the senior vice president of Horus Therapeutics, Inc., a biotech company specialized in computer-

assisted medicine that has since sold its assets, including a number of patents of which Zhen Zhang is an inventor or co-inventor to Johnson and Johnson. While with Horus, he developed ProstAsure, a neural network based predictive model for assessing risk of prostate cancer, which was one of the first such products that had actually been commercialized and offered by a large number of reference laboratories. He is also currently the president of 3Z Informatics, LLC, a small company he founded to develop specialized bioinformatics software tools.

Zhen Zhang received his Ph.D. in Electrical Engineering from University of Pittsburgh in 1987. Over the years, he worked in a number of diverse areas including seismic data analysis for natural resources exploration, confocal image analysis of developing embryonic heart, peptide sequencing from CID mass spectra, biological sequence analysis, and most recently, biological expression data analysis for clinical proteomics. His interest in bioinformatics has always been in tool-making. However, to have someone pay for such activities, he has also had to do some actual data analysis using his and other people's tools.

T16 - Technical Session 16: Bininformatics (IV)

UniMarker as a Fast Sequence Mapping and Genome Comparison Method

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ABSTRACT

The torrent of genomic sequence data and the rapidly increasing number of completely sequenced genomes have increased the need for a more efficient and accurate bioinformatics tool for comparing DNA sequences. Traditionally, BLAST (Basic Local Alignment Search Tool) or BLAST-based sequence alignment has been the method of choice for DNA sequence comparison, despite the computational cost, which escalates with increased length of the sequence, such as the human genome. We have recently developed a sequence alignment-free method that is several hundred times faster than sequence alignment methods for genome-based sequence mapping and comparison. By matching genome-wide unique 16-mer DNA sequence words (those that appear exactly once in the genome and are therefore called UniMarkers or UMs), we have been able to dispense with the usual requirement for sequence alignment and to genomically position the entire database of human single nucleotide polymorphism (SNP) sequences in a few hours using a single desktop computer. By analyzing a genome-wide occurrence spectrum of the same UMs present in both the human and mouse genomes, we have also been able to compare the two mammalian genomes with the same computational efficiency, while producing a human-mouse synteny map that is in excellent agreement with that reported by the Mouse Genome Sequencing Consortium. In this talk, the UniMarker (UM) method and its application for detecting orthologous regions between large genomes (i.e. synteny mapping) will be presented.

BIOGRAPHY

Dr. Ming-Jing Hwang has been a Principal Investigator for the Laboratory for Bioinformatics and Biomolecule Modeling at the Institute of Biomedical Sciences at the Academia Sinica since 1994. Currently, he is also an adjunct Associate Professor at the Institute of Biochemistry and the Institute of Bioinformatics, National Yang Ming University, and at the Graduate Institute of Life Sciences of the National Defense Medical Center. His recent research has focused on developing fast DNA sequence and protein three-dimensional structure comparison algorithms, and using them to study the organization and evolution of genome and protein structures. His laboratory has produced a number of bioinformatics software tools, most of which are freely accessible from the laboratory website, at http://gln.ibms.sinica.edu.tw/software.php.

Between 1989 and 1994, Dr. Hwang worked for Biosym Technologies Inc. (San Diego, CA), first as a postdoctoral research associate, then as a scientist and project leader. He helped lead a team funded by a consortium of pharmaceutical and chemical companies to develop a suite of new-generation molecular energy functions for the simulation and modeling of biological and chemical molecules.

Dr. Hwang received a B.Sc. from the National Taiwan University, an M.Sc. from West Virginia University (Morgantown, WVa), and a Ph.D. from the University of Pittsburgh (Pittsburgh, PA), all in the field of chemical engineering. He was born and grew up in a small town in Tainan County, Taiwan.

T16 - Technical Session 16: Bininformatics (IV)

SNPs – from Technology to Application

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ABSTRACT

A Single Nucleotide Polymorphism (SNP) is one of the most common types of genetic diversity found in man. Recent estimates, based on analysis of many chromosomal regions and a diverse panel of subjects, suggest a frequency of 1 SNP per 500 – 1,000 base pairs. Because of this high incidence of diversity in the human population, SNPs have been proposed to be the method of choice for the identification of loci associated with complex diseases and various Pharmacogenetics studies. The tremendous success of The SNP Consortium to provide publicly available SNPs has made whole genome association studies using SNPs a realistic approach. In addition, the International HapMap Project has promised to provide the most informative SNPs and validated genotyping assays for whole genome association studies.

This presentation will review the latest information on the properties of SNP markers, genotyping technologies and methods available for genetic analysis. In addition, I will summarize other important parameters to be considered when applying SNP technologies in Genetic Research and in Healthcare.

BIOGRAPHY

Clive Bowman C.Stat FLS is Director Population Genetics, Discovery Genetics, Genetics Research at GlaxoSmithKline. For the decade prior to joining GlaxoWellcome in 1998, Clive owned and ran specialist Clinical Research Organizations. Clive received his MSc., in Biometrics from Reading University, UK in 1985 under the guidance of Prof. Roger Mead specializing in design. In 1993 he became a Fellow of Royal Statistical Society. He has led a variety of roles in data exploration, statistics, QA, IT, pharmacokinetics and publishing . For the past five years, Clive and other GSK scientists have been leading the way in the use of high density whole genome SNP maps in the search for susceptibility genes and in pharmacogenetics.

T17 - Technical Session 17: C4I (V): Ubiquitous Communications and Computing

Session Chair

Sing Lin

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BIOGRAPHY

Dr. Sing Lin has been a member of the US Delegation to ITU (http://www.itu.int/home/) for more than 20 years developing global standards for various wireless communications systems including the Third Generation (3G) IMT-2000 wireless systems and beyond. He is currently the President of CSC Research, LLC.

He was the Senior Vice President of Link Communications Inc. from 2000 to 2001. In the 1998-1999 timeframe, Dr. Lin was a District Manager for Wireless Standards Management in AT&T Laboratories. From 1984 to 1998, he was the Director for Wireless Technologies in Telcordia (formerly Bellcore). He was a technical supervisor from 1979 to 1984 on microwave radio systems technologies in Bell Laboratories.

He received the Ph.D. degree in Electrical Engineering from the University of California at Berkeley in 1969 and the B.S.E.E. degree from the National Taiwan University in Taipei, Taiwan in 1963. Dr. Lin is the recipient of Bellcore Award of Excellence, IBM Fellowship at the University of California and Institution Service Award of the Chinese Institute of Engineers – USA (CIE-USA http://www.cie-usa.org/headlines.php). Dr. Lin was a member of the National Council of CIE-USA and was the President of the Greater New York Chapter of CIE-USA (http://207.218.99.194/) in 1998 and 1999. He has been a member of the Telecom Advisory Board of the Ministry of Transportation and Communications in Taiwan for more than 10 years. He has also been a member of the Planning Committee of the annual Wireless and Optical Communications Conference (WOCC http://www.wocc.org/).

T17 - Technical Session 17: C4I (V): Ubiquitous Communications and Computing

Session Chair

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BIOGRAPHY

Jung-Tao Liu received the B.S. degree in electrical engineering from National Taiwan University, Taipei, Taiwan, in 1992 and the M.S. and Ph.D. degree from the School of Electrical and Computer Engineering at Purdue University in 1997 and 1999, respectively.

Since then, he has been at Lucent Technologies, Whippany, NJ, USA where he initially worked on the algorithm design for GPRS/ EDGE receiver. Recently, he has been working on the high speed packet data for WCDMA, MIMO technologies for HSDPA in UMTS. Currently, He is a Member of Technical Staff in CDMA Systems Technology Group, working on multimedia broadcast and multicasting, high speed uplink data access in UMTS and high speed data using OFDM. In general, he is interested in the research of wireless communication theories; more specifically, His current interests include coding theory, equalization, multiple antenna technologies, adaptive modulation, link adaptation, fast scheduling, multi-tone/ multi-carrier wireless communications.

He received the Recognition of Excellence Award from Lucent Technologies in June 2000 for his contribution on EDGE, and the Bell Labs President's Gold Award in 2002 for his work on the MIMO BLAST project. He has 27 patents pending and has authored/ co-authored various number of conference, journal and technical papers. He is currently serving in the technical program committee for CCNC'04.

T17 - Technical Session 17: C4I (V): Ubiquitous Communications and Computing

Convergence of "Communications"

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ABSTRACT

Real-time internet communication is driving the convergence of communication. The always connected characteristics of networks, increased access speed, and the advancement of distributed communication processing architecture are providing a new generation of applications and services that were not plausible just a few years ago. This talk provides an overview of the industry direction along with examples of a suite of ubiquitous communication applications developed for enterprise users. Advancement of distributed communication protocols like SIP, SIMPLE, 3GPP2, and Wi-Fi (IEEE 802.11g) are adding new complimentary capabilities such as the ability to determine the presence of users in a distributed network to provide enhanced communication experience. This presentation also takes a closer look at various service points in network architecture where these applications were introduced. A few examples are SIP UA in IP Phone, Network applications realized by the SIP Servers like the Proxy, Presence Servers, IM Servers, Network applications realized in the Feature Servers, and Web-based Application Servers. Following a web paradigm, these new capabilities, like Instant Messaging, Buddy Lists, integration of 3G/ Wi-Fi networks, Presence, and Presence-enabled voice mails in conjunction with existing capabilities, enable the creation of mobile personal workspaces where the end users constitute free agencies.

BIOGRAPHY

Anwar Siddiqui is currently a Technical Manager of the Avaya Chief Technology Office (CTO) in Lincroft, New Jersey. He is responsible for identifying emerging technologies that are strategic to the implementation of Avaya's converged communication vision. His areas of interest include call processing in IP networks, communication support for distributed systems, and communication protocols for the Internet, such as SIP/ H.323, Enterprise Applications in Wi-Fi Networks, IP/ IEEE/ 3G network agnostic applications, Presence Aware networks, Network Monitoring & Fault Tolerance, QOS, Network Security and Privacy, and OA&M.

Anwar joined Lucent Technologies - Bell Laboratories in 1998 and conducted research on the first generation of Voice over IP call processing systems. In 2000, he joined Avaya Labs Converged Systems Division where he was awarded Distinguished Member of the Technical Staff for his contribution in development of Avaya's Enterprise Class VoIP Systems and various other Real-Time Communication Systems widely used by Fortune 500 companies worldwide.

Anwar Siddiqui holds a Masters degree from Columbia University in the City of New York in Electrical Engineering and a Bachelor degree from Indian Institute of Technology (IIT) – Bombay. He holds numerous patents in the field of computer communication, network security and privacy, QoS etc. He is an active contributor to Internet Engineering Task Force (IETF) and author of various IETF standard specifications. He is also a frequently invited speaker in a

variety of venues across North America, Europe and Asia Pacific, including prominent technology events and conferences.

T17 - Technical Session 17: C4I (V): Ubiquitous Communications and Computing

Pervasive Computing Solutions

Paul B. Chou

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ABSTRACT

Pervasive Computing promises to change every aspect of our daily lives through the integration of computing network with embedded and wireless mobile devices. The ability to access computing on any device, any time and any place, also propels businesses to reassess and transform their processes with innovative solutions. This talk will examine two solution areas that address knowledge worker productivity and supply chain efficiency, respectively. I will overview relevant technologies, review business propositions, and introduce our work in these areas.

BIOGRAPHY

Dr. Paul Chou is a manager and a Research Staff Member in the Pervasive Computing Solutions group at the IBM Thomas J. Watson Research Center. His research focus is on developing next generation solutions to address emerging business opportunities brought by technology advancements in sensors and pervasive devices. He currently leads a research team, tackling software infrastructure and solution challenges associated with RFID. In his previous assignments, Paul led solution research projects including BlueSpace – Office of the Future (www.research.ibm.com/bluespace), Automotive Telematics, Customer Prospect Optimization, Manufacturing Quality Management, and Automated Optical Defect Classification. He has extensive experience and publications in the areas of pervasive computing, data mining, and computer vision systems. Paul received his Ph.D. in Computer Science in 1988 from the University of Rochester.

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Martin C. Eisenschmied

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ABSTRACT

There are a number of dynamics driving the need for wireless (Wi-Fi) services. Business enterprises are building/ intend to build premises based Wi-Fi networks and will be interested in extending coverage through public access networks. There is a significant number of Wi-Fi devices in place today, which is creating a critical mass of users for 802.11 based services. Chip vendors are committed to integrating Wi-Fi capabilities for mobile-based products (i.e. laptops, PDAs, Cellular phones). AT&T Labs has been co-developing and testing new carrier grade service offerings in wireless 802.11b technology. The first, known as Public Wireless LAN or PWLAN, was co-developed in 2003 with IBM, Intel, and others as part of a joint venture called Cometa Networks. The PWLAN WiFi service aims to capture a share in the growing market for wireless access service for business end-users at affiliate locations like airports, restaurants, coffee shops, etc. AT&T views wireless as an enablement technology that will provide greater access to end users in business markets. A major part of the concept is to leverage existing dial up access services like WorldNet Business Dial and to overlay wireless technology to use the existing dial up authentication and billing systems.

BIOGRAPHY

Martin C. Eisenschmied is a District Manager with AT&T Labs leading a research and technical development team exploring IP network access technologies in the area of cable high-speed data, voice over IP on cable (Cable VoIP), digital subscriber line, and wireless LAN (802.11b). He earned a MA degree in communication with distinction from New York Institute of Technology in 1985. He earned a BA degree in communications from Oswego State University (SUNY) in 1978. Mr. Eisenschmied has been working in the TCP/ IP space since 1983 when he became the network manager for the Mount Sinai School of Medicine in New York, subsequently joining AT&T Bell Labs in 1995. Mr. Eisenschmied's tenure at AT&T has centered largely around the testing and development of access network service technologies. Most recently Mr. Eisenschmied's work has been developing and testing AT&T's first service offering into 802.11b technology. Known as Public Wireless LAN or PWLAN, this WiFi service leverages existing AT&T service offerings in DSL, ATM, and private line.

T17 - Technical Session 17: C4I (V): Ubiquitous Communications and Computing

Mobile Media and Home Networking - Driving the Convergence of Computing and Communications

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ABSTRACT

Consumers have witnessed a paradigm shift in the way multimedia information is received and distributed. Advances in wireless communication, mobile computing and home networking are providing us with growing business opportunities and demands for seamless multimedia services to enable rich, connected, and heterogeneous applications. The convergence of technology trend is leading toward offering consumers exciting and end-to-end experiences in communications, personal productivity and entertainment across a broad range of devices and networks. We discuss the convergence trend and investigate the application of mobile multimedia over heterogeneous networks in the first part of the talk. Sample technologies, scalable media access technologies for such applications, shall be addressed in the second part.

BIOGRAPHY

Dr. Heather Yu is a Senior Scientist at Panasonic Information and Networking Technologies Laboratory. She received her B.S. degree from Peking University, her M.A. and Ph.D. degrees from Princeton University all in Electrical Engineering. In 1998, she joined Panasonic where her major focus has been multimedia communication and multimedia information access R&D. Right now, she is working on mobile home network project where her primary interests are multimedia access over heterogeneous networks, wireless/ mobile multimedia communications, and digital rights management. Currently, Dr. Yu serves as Vice Chair of IEEE COMSOC Multimedia Communications Technical Committee, Associate Editor for IEEE Trans. on Multimedia, Editor for ACM Computers in Entertainment and IEEE Multimedia Magazine, Editor for Journal of Informing Science, Guest Editor of JSAC, special issue on Recent Advances in Wireless Multimedia, Guest Editor of Proceedings of IEEE, special issue on Multimedia Security for Digital Rights Management, Conference Steering Committee Member of IEEE ICME and IEEE CCNC, Technical Program Co-chair of IEEE ICC2004 (International Conference on Communications) Multimedia Technologies and Services Symposium, Conference Technical Program Co-Chair of IEEE ITRE2003 (Int. Conf. on Info. Tech. Research and Education 2003), Conference Technical Program Vice co-Chair of IEEE ICME2004 (Int. Conf. on Multimedia and Expo 2004). She served as reviewer for many renowned international journals in the area of multimedia communication and processing. She presents the tutorial on Multimedia security technologies for digital right management at ICME2003 and Globecom2003, published nearly 50 technical papers, holds three US patents, and has more then 20 patents pending in the multimedia communication, multimedia information access, and consumer networking and communications areas.

T17 - Technical Session 17: C4I (V): Ubiquitous Communications and Computing

Variable-Phase-Shift-Based RF-Baseband Codesign for MIMO Antenna Selection

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ABSTRACT

This talk addresses the antenna subset selection technique in multiple antenna systems through a joint design of both RF chains and baseband signal processing. When only a limited number of frequency converters are available, conventional antenna selection schemes show severe performance degradation in most fading channels. To alleviate those degradations, we propose to embed simple, variable phase shifters in the RF chains before selection. The constrained optimum design of these shifters, adapting to the channel state, is given in analytical form that requires no search or iterations. The resulting system shows a significant advantage in terms of the hardware complexity as well as system performance for both correlated and uncorrelated channels. The technique works for both transmitter and receiver design, which inspires the joint transceiver antenna selection. We will cover the background, technical detail, application and performance of the hybrid antenna selection scheme.

BIOGRAPHY

Ms. Xinying Zhang received the B.S. degree from Electronics Engineering Department, Tsinghua University, China in 1998. Since then she has been a Ph.D. candidate in the Department of Electrical Engineering at the Princeton University. Her research lies in the field of communications and signal processing in multiple antenna fading channels, including communication theory, channel equalization, space-time coded system, space-time diversity and multicarrier communication systems.

T18 - Technical Session 18: C4I(VI): Human-Computer Integration

Session Chair

Dr. Michelle Yan

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BIOGRAPHY

Dr. Michelle Yan received her B.S from University of Science and Technology of China (USTC) in 1985 and her M.S. in 1987 and Ph.D. in 1992 from University of Southern California (USC) all in Electrical Engineering. Her expertise and research interests include image analysis, computer vision, as well as multimedia messaging and collaboration.

From 1992 to 1997, Dr. Yan was a Research Assistant Professor of Departments of Psychiatry and Radiology of University of Pennsylvania. She directed the Image Processing Lab, and was responsible for providing advanced image processing solutions to study normal brain functions and psychiatric disorders. She was the Principal Investigator and a Co-investigator of many multi-million dollar research grants funded by National Institute of Mental Health (NIMH) and Department of Energy (DOE).

Dr. Yan has joined Siemens Corporate Research, Inc. as a Member of Technical Staff (MTS) since1997. Her main focus has been multimedia messaging, heterogeneous device collaboration and remote multimedia document access in a limited computing environment and their applications to medical imaging. She has been responsible for many Siemens R&D project implementations and deliveries, and was the leading member and instrumental to Siemens first automatic lung nodule detection product.

T18 - Technical Session 18: C4I(VI): Human-Computer Integration

What is the Next Big Thing after Search?

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ABSTRACT

Search technology has revolutionized how people use the Web. What is the next big thing that can improve people's online experience? We believe the answer is web-based multimodal dialogue systems. With growing amount of structured data online, availability of web graphics rendering engine, and improved speech recognition and speech synthesis, it is possible to create web-based systems that can communicate naturally with users. To interact with such systems, users convey their intent through speech and pointing devices using browsers. In turn, computers respond to users' requests by generating appropriate responses through both automated graphics synthesis and speech synthesis. Through these requests and responses, users can reach the desired information quickly and effectively as if they are interacting with a knowledgeable domain expert or customer representative. In this talk, we will describe a multimodal dialogue system, RIA, and discuss technical challenges in designing various components. In addition, we propose several potential business models for deploying such web-based multimodal dialogue systems.

BIOGRAPHY

James Shaw is currently a senior software engineer at IBM Research in Hawthorne, NY. His group, Intelligent Multimedia Interaction, is working on the next generation human-computer interface to enhance customers' Web experience. By providing customers context-sensitive multimodal interactions that include real-time graphic generation, mouse gestures, and natural dialogue, customers can find desired information or merchandise naturally and effectively without learning to use the system. Such multimodal systems have many commercial applications, such as an automated real-estate agent, travel agent, or customer representative.

James Shaw received his Ph.D. degree in Computer Science from Columbia University. He developed MAGIC, a Web-based summarization system in medical domain. Based on data collected from monitoring machines in operating rooms, MAGIC generated English summary of events occurred during heart surgeries. In 2000, he joined Siemens Corporate Research in Princeton, NJ, as a member of technical staff. At Siemens, he worked on collaborative systems to enhance customers' browsing experience in retail websites, and content management systems to improve the workflow of business groups.

T18 - Technical Session 18: C4I(VI): Human-Computer Integration

Machine Recognition of Human Faces

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ABSTRACT

In recent years, face recognition (including face detection, facial expression recognition in a broader sense) has attracted much attention because of its potential commercial and law enforcement applications. This is not possible without significant technical advances made during the past 30 years. Even though current machine recognition systems have reached a certain level of maturity, their success is limited by the conditions imposed by many real applications. The problem of machine recognition of human faces continues to attract research interest from several disciplines such as image processing, pattern recognition/ learning, neural networks, computer vision, computer graphics and psychology. The major goal of this talk is to give a high-level review of the state-of-the-art research and development on face recognition algorithms and systems. In addition, I will discus technical issues that we are still facing and various challenges of pushing this technology forward.

BIOGRAPHY

Wen-Yi Zhao received the doctoral degree in electrical engineering from the University of Maryland at College Park in 2000. He studied electronic engineering with focus on image processing at the Tsinghua University, Beijing; electrical engineering with focus on computer vision at the University of Virginia. From 1990 to 1993, he was an electrical engineer with Beijing Huahuan Corp. Ltd. During 1997 to 1998, he visited LG Electronics Research Center of America, Inc., where he conducted research in the areas of video indexing and retrieval, development of MPEG-7 standard. Since 2000, he has been working on various problems related to image/ video enhancement, motion estimation, and alignment of 2D-3D and 3D-3D data at the Vision Technologies Lab of Sarnoff Corporation. Dr. Zhao was a tutorial speaker on the subject of face recognition at ICIP 2003. He is the program co-chair of IEEE International Workshop on Analysis and Modeling of Faces and Gestures (AMFG) 2003.

Dr. Zhao is a member of Eta Kappa Nu and Phi Kappa Phi. He is also a member of the IEEE and the IEEE Computer Society.

T18 - Technical Session 18: C4I(VI): Human-Computer Integration

Virtually Physical Whiteboards and Ink Instant Messaging

Zon-Yin Shae

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ABSTRACT

Several workplace field studies have shown the importance of physical whiteboards which are a locale for discussion and collaboration. However, physical whiteboards are only visible locally in one place. Their information is not easily available for remote sites. Especially, strokes written on the whiteboard with ink can not be erased or edited by remote users. Hence, real-time multi-user physical whiteboard collaboration is limited locally to people in the same room. With the recent advance of technology, virtual strokes can be captured by low cost electronic pens. Low cost projectors can then be used to display the strokes on the whiteboard. Consequently, we can virtualize the physical whiteboard, and enable the remote collaboration for discussion, design, and editing in networked environment. At the same time, the advantages of physical whiteboards are maintained. The purpose of this project is to study the various issues and potential applications of this networked virtually physical whiteboard system. The issues, for examples, are augmented reality in virtual meeting room, indexing and searching of the stroke media contents, and streaming and broadcasting mechanisms. The potential applications are team collaboration, collaborative design, distance education and learning. We also extend this concept into the electronic ink instant messaging using pervasive devices.

BIOGRAPHY

Zon-Yin Shae is at the IBM Watson Research Center, where he works in the area of VoIP, SIP, multimedia streaming, media enabling e-business applications and the use of multimedia to bridge physical and virtual environments. He led IBM multimedia streaming project used for the Atlanta Olympic Game. He is currently working on the VoIP/ SIP converged enterprise applications, infrastructure and services.

Dr. Shae received the B.S. and M.S. degrees in electronic engineering from the National Chiao-Tung University, Taiwan, 1976 and 1978 respectively, and the Ph.D. degree in electrical engineering from the University of Pennsylvania, Philadelphia, USA, 1989. From 1980 to 1984, before he pursued his Ph.D. degree, he worked as an engineer in the areas of communication system and microprogramming CPU design for signal processing. Since March 1989, he has been with IBM Watson Research Center, New York. Dr. Shae has published tens of technical papers and applied tens U.S. patents. He has received various awards from IBM Watson Research Center for his contributions in the area of multimedia communication.

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Augmented Reality and Its Industrial Applications

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ABSTRACT

Augmented reality: Augmented reality (AR) is the technology that provides the user with an enhanced visualization of the real world by superimposing the real-world view with aligned virtual objects generated by computer and additional information. The user can use AR to work with and examine the physical world, while receiving additional information about the objects of interest through a display. In this talk I will introduce some industrial AR applications I worked on recently, please be advised that this is just a small part of AR work at Siemens Corporate Research, Inc.

SEAR: A maintenance engineer who talks to pumps and pipes may not seem like the ideal person to entrust with keeping a factory running smoothly, but we hope that our mobile Speech-Enabled Augmented Reality (SEAR) framework will enable such behavior in the future to be anything but suspicious! In this paper we describe how the SEAR framework uses our flexible and scalable vision-based localization techniques to offer the engineer a seamless multi-modal user interface. This interface juxtaposes a graphical AR view with a context-sensitive speech dialog concerning the industrial equipment located in his immediate vicinity.
Access3D is an AR application that allows the user to superimpose 3D computer generated graphic models or texts on static images or video frames. In addition, Access3D can be used to inquire information linked with the respective 3D models. Access3D uses VRML models for visualization. In our AR application, the virtual 3D models are directly converted from CAD data and can be hyper-linked to the respective CAD database. To superimpose 3D models in correct alignment with the image, VRML requires the parameters of the physical camera (that captures the image or video) be calibrated explicitly. The AR views are generated by aligning the virtual camera with the physical camera in VRML visualization. In order to obtain correct camera calibration, we apply data normalization in different stages of process to increase the numerical stability.

FARHMD: We apply Feature-based motion tracking technology for augmented reality (AR) with an optical-see-through head-mounted-display (HMD). Such AR systems can be used in industrial for training and maintenance. In AR, tracking means to extract the 3D pose (including position and orientation) of the viewer. In the case with an optical-see-through HMD, the tracking is to recover the position and orientation of the user's eye. To do so, we attach a camera to the HMD and apply the tracking algorithm that makes use of the natural visual features. Our experiments show that our feature-based tracking has better performance in many cases than that of the marker-based tracking systems -- in term of faster frame rate and more stable superimposition.

BIOGRAPHY

Xiang Zhang got his BS and MS degrees from the Tsinghua University in Beijing. He joined Siemens Corporate Research not long after he finished his PhD study at the University of Florida in 1999. At Siemens Corporate Research, Inc., Xiang Zhang has been doing research and development in the area of augmented reality. His research interests include augmented reality visualization, camera calibration, visual based motion tracking, and physical based simulation and visualization.