Welcome Remarks and Introduction

Jiaguang Sun

Dean, School of Information Science and Technology
Director, Tsinghua National Lab for Information Science and Technology
Tsinghua University

Jiaguang Sun

Biography

Prof. Sun is an expert in software areas. He was born in Zhenjiang, Jiangsu Province in January, 1946 and graduated from the Department of Automation of Tsinghua University in 1970. He is the dean of School of information Science and Technology, dean of school of software, deputy director of Academic Affairs Committee of the University, member of the Academic Degree Committee and the Disciplines Evaluation Panel of the State Council, deputy director of Teaching Supervision Committee for Computer Science and Technology and director of Teaching Supervision Committee for Software Engineering of the Ministry of Education. He is also director of the National Engineering Research Center of CAD Supporting Software, director of Tsinghua National Laboratory for information Science and Technology, president of Executive Council of China Engineering Graphics Society, and Vice president of National Natural Science Foundation of China. He was elected to be a member of the Chinese Academy of Engineering in 1999.

Prof. Sun dedicated in teaching and R&D activities in Computer Graphics, Computer-aided Designing, Software Engineering and System Architecture. He has been in charge of some major software R&D projects, including, 3D Geometry Modeling system, integrated CAD/CAM system, product data management and Product Lifecycle Management (PDM/PLM) system, and Enterprise Information Integration system (EIS).

Chen Xu

Vice President
Tsinghua University

Chen Xu

Biography

Professor Xu Chen received her Ph.D in Electronic Engineering from Tsinghua University in 2005. Prior to her new appointment as senior administrator, she was a professor in the Department of Electronic Engineering and Deputy Director of the Steering Committee for Student Affairs of the University. Her primary areas of research are ultra-high vacuum techniques, ultra-high sensitive leak detection, and mass spectrometry.

Jun Li

Jun Li

Executive Vice Dean, School of Information Science and Technology
Tsinghua University

Biography

Dr. Jun LI is currently Dean of Research Institute of Information Technology, and Executive Vice Dean of School of Information Science and Technology, Tsinghua University, Beijing, China. He is also Deputy Director of the Tsinghua National Lab for Information Science and Technology, Beijing, China.

Before rejoined Tsinghua in 2003, Dr. LI was held executive positions at ServGate Technologies that he co-founded in 1999. Prior to that, he worked in TeraLogic and EXAR, both as senior engineer. In between of his MS and PhD studies, He was an assistant professor then lecturer in the Department of Automation, Tsinghua University.

Dr. LI holds a PhD degree in Computer Science from New Jersey Institute of Technology (NJIT), and MS and BS degrees in Control and Information, respectively, from Tsinghua University. His research interests include network security, pattern recognition, and image processing (recent research can be found at http://security.riit.tsinghua.edu.cn).

Dr. LI is a board member or advisor to several venture capital and startup companies.

Zhisheng Niu

Zhisheng Niu

Vice Dean, School of Information Science and Technology
Tsinghua University

Biography

Zhisheng Niu graduated from Northern Jiaotong University, Beijing, China, in 1985, and got his M.E. and D.E. degrees from Toyohashi University of Technology, Toyohashi, Japan, in 1989 and 1992, respectively. After spending two years at Fujitsu Laboratories Ltd., Kawasaki, Japan, he joined with Tsinghua University, Beijing, China, in 1994, where he is now a full professor at the Department of Electronic Engineering. He is also an adjunction professor of Northern Jiaotong University. He received the PAACS Friendship Award from the Institute of Electronics, Information, and Communication Engineers (IEICE) of Japan in 1991, Best Paper Award (1st prize) from the 6th Chinese Youth Conference on Communication Technology in 1999, and Best Paper Award from the 14th Asia-Pacific Conference on Communication (APCC) in 2007. His current research interests include teletraffic theory, mobile Internet, radio resource management of wireless networks, and cognitive and multiple radio networks. Dr. Niu is a fellow of the IEICE, a senior member of the IEEE, Director of IEEE Asia-Pacific Board and Beijing Chapter Chair of IEEE Communication Society, and council member of Chinese Institute of Electronics (CIE).

Yannis C. Yortsos

Dean, Viterbi School of Engineering
University of Southern California

Yannis C. Yortsos

Biography

Yannis C. Yortsos is the Dean of Engineering at the USC Viterbi School of Engineering and the Chester F. Dolley Professor of Petroleum Engineering in the Department of Chemical Engineering.

He earned his B.S. in Chemical Engineering from the National Technical University, Athens, Greece, in 1973; his M.S. in Chemical Engineering from the California Institute of Technology; and also his Ph.D in Chemical Engineering at Caltech in 1979.

He has done significant research in fields that include fluid flow, transport, and reaction in porous media, viscous flows in porous media geometries, phase change in porous media and applications to the recovery of subsurface fluids (oil recovery, soil remediation).

Cauligi Raghavendra

Senior Associate Dean for Strategic Initiatives
Viterbi School of Engineering
University of Southern California

Cauligi Raghavendra

Biography

Dr. Raghavendra is a Professor of Electrical Engineering and Computer Science and is Senior Associate Dean for Strategic Initiatives for the Viterbi School of Engineering at the University of Southern California , Los Angeles. He was Chairman of EE-Systems Department from 2003-2005 and Senior Associate Dean for Academic Affairs during 2005-2006. Previously, he was a faculty in the Department of Electrical Engineering-Systems at USC from 1982-1992, as Boeing Chair Professor of Computer Engineering in the School of Electrical Engineering and Computer Science at the Washington State University in Pullman, from 1992-1997, and with The Aerospace Corporation from August 1997-2001. He received the B.Sc (Hons) physics degree from Bangalore University in 1973, the B.E and M.E degrees in Electronics and Communication from Indian Institute of Science, Bangalore in 1976 and 1978 respectively. He received the Ph.D degree in Computer Science from the University of California at Los Angeles in 1982. Dr. Raghavendra is a recipient of the Presidential Young Investigator Award for 1985 and is a Fellow of the IEEE. His research intersts are Computer Networks, Wireless and Sensor Networks, parallel and distributed computing.

Keynote Talks

Iraj Ershaghi

Iraj Ershaghi

Omar B. Milligan Professor
Director of the Petroleum Engineering Program,
Director of the West Coast Petroleum Technology Transfer Council, USC
Executive Director of the Chevron–USC Center for Smart Oilfield Technologies at USC

Biography

Dr. Ershaghi is the Omar B. Milligan Professor and Director of the Petroleum Engineering Program at USC. He is also serving as the USC Executive Director of the Center for Smart Oilfield Technologies at USC. He has a B.S. degree in Petroleum Engineering from University of Tehran and an M.S. and a Ph.D. in petroleum engineering from USC. Prior to joining the faculty at USC in 1972, he worked for AGIP-SIRIP, Signal Oil and Gas Company and California State Lands Commission. His areas of research and publications are reservoir characterization, well testing and improved recovery processes. As a registered engineer, he has served as a consultant on projects with many U S and national and international oil and gas companies. During 1996-2006, he served as USC Director of the U. S. Department of Energy West Coast Petroleum Technology Transfer Council mentoring small independent producers in California on effective solutions to stimulate mature oilfields.

He has been the recipient of SPE's Distinguished Faculty Award, Distinguished Member Award, Western North America Distinguished Service Award, Technology Transfer Award for Development of the Smart Oilfield Technology Curriculum at USC and Western Regional North America Reservoir Description and Dynamics Award. As a fellow of Institute for Advancement of Engineering, he has received the Outstanding Educator Award of American Association for Advancement of Engineering and the Outstanding Educator Award of Orange County Council of Engineers and Scientists. He served as SPE's Distinguished Lecturer during 2006-2007.

Enhancing EHS, Maximizing Recovery Efficiency and Minimizing OPEX and CAPEX with IT Driven Intelligent Oilfield Operations

In the absence of economically viable alternatives to conventional fossil fuel resources, hydrocarbons will continue to be the energy source of choice for many decades. Worldwide dependency on hydrocarbon liquids and natural gas, in all likelihood, will continue well into the next century. On the two ends of the scales are increasing demand and increasing concerns about the EHS and the economics of investments in hard to reach resources. The cyclical nature of petroleum Industry in the past has at times challenged the economic viability of exploration and development projects. To counteract the volatile oil and gas prices, during its 150 year life, the modern petroleum industry, has continued its service to the mankind by supplying liquid and gaseous hydrocarbons through investment in new and advanced technologies. Recent advances in the expanding role of information technology are helping to reduce the cost of production, improve the efficiency of the overall system and enhance environmental , health and safety aspects of the oil and gas operations.

In this presentation, an overview is made of the role of information management and decision support systems in emerging technologies for extending the economic

recovery of residual oil in mature oilfields and for accessing new territories such as the ultra deep, the Arctic and the unconventional resources. As a case in point the role of CiSoft at USC in the training of a new breed of engineers and research aspects of IT Driven Intelligent Oilfield Operations will be discussed.

Zhiqiang Yin

Department of Electronic Engineering,
Tsinghua University

Zhiqiang Yin

Biography

Professor Yin Zhiqiang, in the Department of Electronic Engineering, Tsinghua University and Chief scientist in Tsinghua Solar Ltd., Beijing, China, has been engaged in research, development and production of all-glass evacuated collector tubes, tubular collectors and solar water heaters since 1979. He invented "Graded Al-N/Al selective absorbing surface"; "Water-in-glass" close-coupled solar water heater; "E-W" direction of tubes of solar collectors, etc.. He transferred the achievements to industry, has developed four generations of magnetron sputtering systems for manufacturing Al-N/Al selective absorbing surface with his colleagues, the absorbing surface is very cost- effective for domestic solar hot water systems, and developed key equipments of the production line for manufacturing all-glass evacuated collector tubes. Solar heating in apartment building, green house, solar air-conditioning, sea desalination and industry heat, etc. are still under intensive study. He was the first author of three China national standard of "all-glass evacuated solar collector tube", "Test methods for thermal performance of domestic solar water heating systems" and "specification of domestic solar water heating systems" which are useful for supporting the developments of solar thermal industry, which have been issued by the National Standard Bureau. Solar thermal industry grows rapidly in China, Total shipment was around 23 million m2 solar collectors in 2008, all-glass evacuated tubular collectors has got the domestic market share of 91% in China, and have been exported all over the world. China has been the biggest producer and user of solar water heaters since the 1990s, more than six hundred thousand people have the jobs in Chinese solar thermal industry. Professor Yin Zhiqiang who is the founder of Chinese solar thermal conversion and applications.

Developments of Solar Thermal In China

China has an abundant solar energy resource. Solar thermal collectors, particularly all-glass evacuated tubular collectors, have been studied since 1979 in the Department, Tsinghua University, and solar thermal industry has developed rapidly for 17 years with the partnership of industry – university - science. We have own industry property and completed production chain of all-glass evacuated tubular collectors and solar water heaters. China has world share of new installed solar collectors around 81.3% in 2007. There are various solar thermal systems providing domestic hot water. Medium temperature collectors are under extensive study for process heat.

Fred Aminzadeh

Fred Aminzadeh

Research Professor

Biography

Fred Aminzadeh is research professor at the University of Southern California. He served as president of Society of Exploration Geophysicists in 2007-2008. Aminzadeh previously worked for Unocal with both technical and management responsibilities. He also was an adjunct professor of Geosciences department at Rice University and held many other full time and part time academic positions during his career. He has a Ph. D. from University of Southern California. His thesis dealt with the analysis of layered earth media. He is a member of Russian Academy of Science, a member of Azerbaijan Oil academy, and National Research Council's Committee on Seismology. He has served as a member of DOE's Unconventional Resources Technology Advisory Committee, the chairman of the SEG Research Committee and Vice President of SEG. He has three patents and an extensive list of publications in diverse areas including eleven books such as those on Reservoir Characterization, Petroleum Geology of South Caspian Basin, 3-D Seismic Modeling Advances in Seismic Data Processing, Geophysics for Engineers, and Petroleum Industry Applications of Pattern Recognition and Soft Computing. Several of his books have been translated into Chinese and other languages.

Multi-Disciplinary Technology Applications in the Energy Industry with a Focus on Geosciences, Artificial Intelligence and Pattern Recognition

What are the significant advances in geophysical technologies and artificial intelligence, soft computing and pattern recognition in the past decade? What are current trends? Where do we want to be within the next ten years? What do we need to do to address challenges associated with declining oil fields and cost effective ways to go after alternative sources of energy? These questions will be addressed in conjunction with our most challenging exploration and field development problems. The need for introduction of advanced geophysical technologies and true integration with other disciplines in order to meet those challenges will be discussed. The ever increasing role of geophysical methods and the contributions geophysicists are already making in our industry will be highlighted. This presentation will build on and update several recent surveys on the key technology challenges as well as recent advances and the road ahead for geophysics.

Among topics to be covered are state of the art and expected future developments in the following areas: Seismic Imaging, Dynamic Reservoir Characterization, How to Benefit from and Handle Data Explosion, Non-linear Seismic Data Processing and Analysis, Uncertainty, Risk and Unconventional Statistical Methods, Combining Human and Machine Intelligence, Seismic Inversion and Meta-Attributes, New Acquisition Techniques (passive seismic, cable-less acquisition system, multi azimuth/ wide azimuth data), Time Lapse (4D) Methods, Controlled Source Electromagnetic), Multi-Component (Vector) Exploration, and Information / Visualization Technology.

Practical applications of these concepts from deep water exploration to exploration in difficult data areas as well as exploration and production of unconventional resources, optimization of reservoir monitoring and production to increase recovery factor and exploration and production of geothermal energy will be reviewed. The need for multi-disciplinary education approach and collaborative work to solve major technical problems in exploration and to help address the growing need to find new resources will be discussed.

Yannis C. Yortsos

| Dean of Engineering

Yannis C. Yortsos

Biography

Yannis C. Yortsos is the Dean of Engineering at the USC Viterbi School of Engineering and the Chester F. Dolley Professor of Petroleum Engineering in the Department of Chemical Engineering.

He earned his B.S. in Chemical Engineering from the National Technical University, Athens, Greece, in 1973; his M.S. in Chemical Engineering from the California Institute of Technology; and also his Ph.D in Chemical Engineering at Caltech in 1979.

He has done significant research in fields that include fluid flow, transport, and reaction in porous media, viscous flows in porous media geometries, phase change in porous media and applications to the recovery of subsurface fluids (oil recovery, soil remediation).

Overview of Green and Smart for a Sustainable Future

Zheng Li

Zheng Li

Professor, Department of Thermal Engineering
Director, Tsinghua BP Clean Energy Research and Education Center
Assistant Director, Low Carbon Energy Laboratory
Tsinghua University

Biography

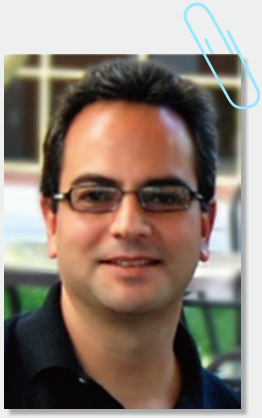
Zheng Li got his bachelor and master degrees from Department of Thermal Engineering, Tsinghua University in 1986 and 1988. He then had worked for three years in industry before he reentered Tsinghua University and got his PhD in 1994. He became a faculty member of Department of Thermal Engineering at the end of 1994 and became a full professor in 2000. He founded Tsinghua BP Clean Energy Research and Education Center in 2003 and has been the director of the center since then. Prof. Li was awarded the National Award of Science and Technology of China for his contribution in the development of simulation technology for circulating fluidized bed power plant. He has been Changjiang Scholar Professor since 2008. Besides technical studies, Prof. Li also works on energy strategy and policy study for China and leads several national and international research projects.

Chinese Energy Challenges and Way Out

Along with fast economic growth, China is facing severe energy challenges and has great urgency in looking for short term release and long term sustaining solutions. This talk will have two parts. The first part gives a brief introduction about the Low Carbon Energy Laboratory of Tsinghua University, with the aim to inform the audience about Tsinghua's efforts in tackling with domestic energy and environmental problems. As for international cooperation, the newest initiative in setting up Tsinghua-Cambridge-MIT Alliance for low carbon energy will be briefed.

The second part endeavors to give the audience a comprehensive picture about Chinese energy situation in a very short time. The talk will describe the major energy challenges and explain the underlying driving forces. By revealing the critical factors that will influence the future energy consumption of China, the talk will finally present some thoughts for helping Chinese energy into a sustainable track.

Track I: IT-Driven Energy and Sustainability



Cyrus Shahabi

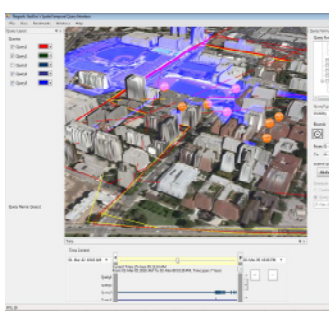
Cyrus Shahabi

Biography

Cyrus Shahabi is currently an Associate Professor and the Director of the Information Laboratory (InfoLAB) at the Computer Science Department and also a Research Area Director at the NSF's Integrated Media Systems Center (IMSC) at the University of Southern California. He is also the CTO and co-founder of a USC spin-off, Geosemble Technologies. He received his B.S. in Computer Engineering from Sharif University of Technology in 1989 and then his M.S. and Ph.D. Degrees in Computer Science from the University of Southern California in May 1993 and August 1996, respectively. He has two books and more than hundred articles, book chapters, and conference papers in the areas of databases, GIS and multimedia. Dr. Shahabi has been the principle investigator of five NSF grants and has continuously received funding from several other agencies such as NASA, NIH, DARPA, AFRL, and DHS as well as several industries such as Google, Microsoft, NCR and Chevron. He is currently an associate editor of the IEEE Transactions on Parallel and Distributed Systems (TPDS) and on the editorial board of ACM Computers in Entertainment magazine. He is the founding chair of IEEE NetDB workshop and also the general co-chair of ACM GIS 2007, 2008 and 2009. He regularly serves on the program committee of major conferences such as VLDB, ACM SIGMOD, IEEE ICDE, ACM SIGKDD, and SSTD. Dr. Shahabi is the recipient of NSF CAREER award as well as the U.S. Presidential Early Career Awards for Scientists and Engineers (PECASE).

GeoRealism: Expanding the human ability to comprehend a larger geo space

Today's technological advances in sensory devices and information technology make it possible to acquire vast amounts of data about the Earth and its phenomena. These data called geo-data can be aerial/ground imagery, distributed/mobile climate and pollutant data, traffic and video data, data from mobile devices, etc. Hence, we pursue an opportunity to exploit the common coordinates of time and space to fuse these datasets into actionable knowledge in order to deal with various natural, man-made and socioeconomic crises more effectively. Towards this end, we believe a new computing paradigm—we call GeoRealism—will give us these capabilities to better comprehend large geo-spaces. To make GeoRealism possible, we must address four deep scientific and hard "data-mismatch" problems: the geo-data are 1) not available at the time, space, quality, and resolution needed, 2) not available at the right form that is needed; 3) not integrated correctly with other relevant datasets; 4) not processed as quickly as needed. We plan to address these four challenges through 1) active sensing, 2) inferred archiving, 3) dynamic integration and 4) graceful scaling. GeoRealism will enable a broad range of applications in disaster management, military intelligence, real-estate and training, to name a few.



In this talk, I will focus on GeoRealism and explain its vision and briefly discuss our current activities in several areas towards the realization of GeoRealism.

Yi Luo

Yi Luo

Professor, State Key Lab on Integrated Optoelectronics
Department of Electronic Engineering, Tsinghua University

Biography

Yi LUO received the B. E. Degree in engineering from Tsinghua University, Beijing, China, in 1983, the M. E. degree and the Ph. D. degree in electronic engineering both from the University of Tokyo, Tokyo, Japan, in 1987 and 1990, respectively.

During Apr. 1990 to Mar. 1992, he was with the Optical Measurement Technology Development Company, Ltd., Tokyo, Japan. In 1992, he returned to Tsinghua University, Beijing, China and appointed as a lecturer of the Department of Electronic Engineering. Since the end of 1992, he has been a full professor of the same department. From 1997, He has also been the director of Sate Key Lab on Integrated Optoelectronics.

His research interests include DFB lasers including those with gain coupling and monolithic integration of DFB laser with other semiconductor optoelectronic devices, key technologies for solid state lighting, materials growth technology using MOCVD and MBE, devices fabrication technology such as dry etching, thin film deposition, packaging technologies for high speed optoelectronic devices and solid state lighting such as 40 Gb/s EML transmitter and modules of white LEDs for lighting applications.

He has published more than 200 technical articles including 68 peer reviewed international journal papers and about 80 international conference papers.

Key Technologies for Solid State Lighting -- from Epitaxy to Lighting Fixture

Due to many advantages such as potential higher light emission efficiency, small volume, long lifetime, environmental protection, and so on, solid state lighting based on the combination of high power GaN-LEDs and phosphor not only has been the hot research topics in semiconductor optoelectronics, but also the dazzling star in high-tech production. However, there are still many problems including the relatively lower luminous efficiency of the light source and the incompatibility with traditional lighting modes that limit its application field especially in high-level market. The key technologies for solid state lighting are epitomized in this report and the latest developments in our research group are reviewed.

Firstly, owing to the lack of large size and low cost homogeneous substrates, III-nitride materials are commonly grown on other substrates, such as sapphire, SiC, and Si. A “two-step” method has been developed to reduce the dislocation density of GaN when it is grown on sapphire substrates. The key parameters for high quality GaN bulk growth have been discussed and an evaluating method for crystal structures based on the high resolution X-ray diffraction (HR-XRD) has been introduced. It is found that the optimal recrystallization time and the growth of high temperature buffer layer using a low V/III ratio are helpful to improve the crystal quality of GaN. Furthermore, in order to determine the twist angle of GaN films precisely, a simple and effective geometrical model is established to distinguish the contributions of tilt and twist to the full width at half maximum of HR-XRD Φ-scan curves.

Secondly, nitride LED materials are considered to suffer from the strain due to the large lattice mismatch. A strain control method for blue InGaN/GaN multiple quantum wells (MQWs) growth is presented. By inserting an optimal InGaN layer underneath the MQWs, the quantum confined Stark effect is suppressed and the nonradiative recombination centers in the MQWs are decreased. As a result, the internal quantum efficiency of the MQWs increases to above 50%. Additionally, the carrier injection efficiency of the blue InGaN/GaN MQWs LED is studied. By analyzing the injection current dependent electroluminescence (EL) efficiency of the LEDs with different

quantum well thickness and Al contents in p-AlGaN, the interface stress between the MQWs and p-AlGaN is believed to influence the carrier injection efficiency dramatically. To reduce the tunneling recombination at the interface, a p-GaN layer with the optimized Mg concentration is inserted between the MQWs and p-AlGaN, and found to prevent electrons hence increase the EL efficiency effectively.
Finally, high power LEDs packaged through traditional methods, which act as point light sources with high luminous intensity, are generally difficult to be applied in actual lighting system. Therefore, human-eye-friendly, high efficiency, high reliability and luminance distribution controllable packaging technology also plays a key role in solid state lighting. This report reviews the packaging and application technology of high power white LEDs including
the lower thermal resistance and high reliable packaging of a group of LEDs, unsymmetrical three-dimensional optical system research based on non-image optics, and the actual optical system design (such as street lamp) with specific luminous intensity distribution, and so on.

Don Zhang

| CEE Dept, USC

Don Zhang

Biography

Dongxiao Zhang is the Marshall Professor of water resources and petroleum engineering at the Sonny Astani Department of Civil and Environmental Engineering and Mork Family Department of Chemical Engineering and Materials Science at The University of Southern California. He received his M.Sc. and Ph.D., both in hydrology, from University of Arizona, in 1992 and 1993, respectively. Prior to joining USC, Zhang was the Miller Chair professor at the Mewbourne School of Petroleum and Geological Engineering of University of Oklahoma from 2004 to 2007 and was a senior scientist and a team leader at Los Alamos National Laboratory from 1996 to 2004. Zhang has also served as a ChangJiang Chair professor at Nanjing University and the Founding Associate Dean at the College of Engineering of Peking University in China. Zhang is an expert in stochastic partial differential equations and their applications to hydrology and reservoir simulations. His book "Stochastic Methods for Flow in Porous Media" (Academic Press, 2002) is devoted to this subject. His recent research interests also include sequestration of carbon dioxide in geological formations as a viable option for mitigating the greenhouse gas effect. He has published over 80 peer reviewed articles and about 40 conference proceedings papers. Zhang currently serves as associate editors for Water Resources Research, Society of Petroleum Engineers Journal, Advances in Water Resources, Vadose Zone Journal, Journal of Computational Geosciences, and SIAM Multiscale Modeling and Simulation.

Sequestration of Carbon Dioxide in Geologic Formations: A Viable Option for Mitigating the Greenhouse Effect

A dramatic increase in anthropogenic Greenhouse Gas (GHG) emissions since the Industrial Revolution is thought to be responsible for current global warming trends. Carbon dioxide comprises more than half of all atmospheric GHG emissions, resulting primarily from combustion of fossil fuels. Carbon management is a broad national and international policy response to address these climate change issues. Sequestration is the most direct carbon management strategy for long-term removal of CO2 from the atmosphere, and is likely to be needed for continuation of the fossil fuel-based economy and high standard of living. Sequestration of carbon dioxide in geologic formations is the immediate, low-cost sequestration option. I will discuss the potentials and scientific challenges associated with geologic carbon sequestration and present some ongoing USC research efforts.

Ruixi Yuan

Ruixi Yuan

Professor, Department of Automation
Tsinghua National Lab for Information Science and Technology
TSINGHUA UNIVERSITY

Biography

Ruixi Yuan received B.S. in Physics from University of Science and Technology of China in 1985, Ph.D. in Electrical Engineering from Texas A&M University in 1991. From 1991 to 2005, he conducted research and developments in wireless and high speed networking in the United States. Dr. Yuan returned to Tsinghua University in 2005 and is currently a full professor at the Department of Automation. His current research focuses on network communications and complex system dynamics. Dr. Yuan is also a principal investigator in the Tsinghua-UTC Research Institute for Building Energy, Safety and Control Systems and leads a project to study the use of IT technologies to improve building energy efficiency and safety.

Dr. Yuan published more than 30 peer-reviewed journal and conference papers and is the inventors of 6 U.S. patents in the area of network communications. He also authored an Addison-Wesley Professional Computing Series book "Virtual Private Networks – Technologies and Solutions."

Green IT for Energy Efficient Buildings

Buildings usage consumes about 40% of the total energy, and 68% of the total electricity. While individual building equipments are equipped with various control functions for efficient operation, the lack of comprehensive data collection, information synthesizing and the subsequent control system optimization prevented the majority of building from achieving energy efficient operation. We will describe our research effort in three related areas that geared towards the energy efficient buildings. (1) Using wireless sensor networks to gather comprehensive building environment and occupancy data. (2) Establish standard data formats for energy efficient operation, and (3) Simulation based optimization for low energy building operation. These efforts are integrated into a test-bed in the Tsinghua University Low Energy Demo Building.

Ellis Meng

PhD, Assistant Professor
Viterbi Early Career Chair
Department of Biomedical Engineering
University of Southern California

Ellis Meng

Biography

Ellis Meng received her Bachelor's degree in Engineering and Applied Science from the California Institute of Technology in 1997. She pursued her graduate studies in Electrical Engineering and received her M.S. in 1998 and Ph.D. in 2003 at the same institution. While at Caltech, she was a recipient of the Intel Women in Science and Engineering Scholarship, Caltech Alumni Association Donald S. Clark Award, and Caltech Special Institute Fellowship. She joined the Biomedical Engineering Department at USC in the summer of 2004. Dr. Meng is a researcher in the Biomimetic Microeletronic Systems (BMES) National Science Foundation (NSF) Engineering Research Center (ERC) in which she is a thrust leader for interface technology and the Associate Director of Education and Student Diversity. She is a member of Tau Beta Pi, IEEE, ASME, BMES, and SWE. Dr. Meng is a recipient of the NSF CAREER award and was recently awarded the Viterbi Early Career Chair in the Viterbi School of Engineering.

Biologically-Inspired Smart Microfabricated Sensor and Actuator Networks

Novel micro-and nanotechnologies enable innovative devices that mimic the sensing capabilities of mechanoreceptors in the skin. In particular, the Biomedical Microsystems Laboratory is interested in the integration of multiple modalities (e.g. electrical, mechanical, and chemical) in miniaturized devices measuring no more than a few millimeters for use in a variety of applications from fundamental scientific research, biomedical diagnostics, and therapy to unstructured environments such as disaster sites. Our approach focuses on the investigation of novel microelectromechanical systems (MEMS) fabricated from flexible polymer substrates. This talk will describe efforts to produce polymer-based microsystems that integrate both sensing and actuation into flexible arrays with emphasis on Parylene C technology. Parylene C is well known historically as a coating material but has gained popularity as a structural material in MEMS in a wide variety of applications. Current efforts on these microfabricated arrays towards real time control of interaction and manipulation are discussed.

Yangdong Deng

Yangdong Deng

Institute of Microelectronics
Tsinghua University

Biography

Yangdong (Steve) Deng received his Ph.D. degree from Carnegie Mellon University in 2006. He received his M.S. and B.E. degrees from Tsinghua University.

During his Ph.D. research, he proposed a new 3-dimensional VLSI paradigm. The so-called 2.5-D integration scheme could deliver superior performance without lowering manufacturing yield. His Ph.D. work was reported on International Solid State Circuit Conference 2005 as a special session.

He was with Magma Design Automation as a Consulting Technical Staff since 2006. Prior to that, he was with Incentia Design Systems from 2004 to 2006 (before finishing his Ph.D. dissertation). In both companies, he developed leading-edge Electronic Design Automation (EDA) tools. In 2006 he received an award from Magma Design Automation for his technical contributions.

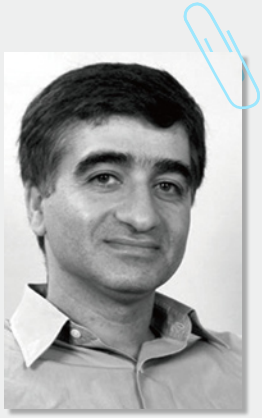
Since 2008, he has been an associate professor in the Institute of Microelectronics, Tsinghua University. He is also a joint faculty member of the Center of Advanced Mobile Computing Technology. His research interests include parallel EDA, Electronic System Level (ESL) design, and parallel program optimization. His research work is supported by the National Key Project on EDA, Intel University Program, Deng Feng Foundation, and NVidia Professor Partnership Awards.

In 2008, he organized a short course on NVidia CUDA technology, which was the first CUDA class in Mainland China. He was the invited speaker of NVidia CUDA lecture series for 12 leading universities of China. During his master study, he co-authored a book, Structural Digital System Design and High Level Synthesis, which was chosen as a standard textbook by China Department of Education and widely used by Chinese universities.

Massively Parallel Computing for Electronic Design Automation

An exciting new trend in high-performance computing is to solve general purpose computing tasks on graphic processing units (GPUs). Electronic Design Automation (EDA) applications generally involve irregular data access patterns, which pose significant challenges for efficient GPU implementations. In this talk, we introduce our recent work on efficient GPU implementations for the Sparse-Matrix Vector Product (SMVP) problem, which is widely used in EDA applications but generally believed to be a very difficulty problem for GPUs. For typical EDA problem instances, our SMVP kernels could achieve a speedup of one order of magnitude over the CPU equivalents. Experimental results demonstrate that our SMVP kernel outperforms all published work on EDA related problem instances. We also show that after proper re-formulating, many EDA applications, such as static timing analysis and graph traversal, can be accelerated by a factor of 50X on GPUs.

Track II: Green IT and Intelligent Software


Massoud Pedram

Massoud Pedram

Ph.D. in Electrical Engineering and Computer Sciences, 1991, University of California, Berkeley, CA.

Biography

Massoud Pedram received a B.S. degree in EE from the California Institute of Technology in 1986 and a Ph.D. degree in EECS from the University of California, Berkeley in 1991. He then joined the EE department of USC where he is currently a professor. Dr. Pedram has served on the technical program committee of many EDA conferences, including the Design automation Conference (DAC), Design and Test in Europe Conference (DATE), Asia-Pacific Design automation Conference (ASP-DAC), and International Conference on Computer Aided Design (ICCAD). He served as the Technical Chair and General Chair of the ISLPED in 1996 and 1997, respectively. He has published four books, 80 journal papers and more than 200 technical conference papers. His research has received a number of awards including two ICCD Best Papers, two DAC Best Papers, and an IEEE T-VLSI Best Paper. He is a recipient of the NSF's Young Investigator Award (1994) and the Presidential Faculty Fellows Award (a.k.a. PECASE Award) (1996). Dr. Pedram is a Fellow of the IEEE, VP of Publications for the IEEE Circuits and Systems Society, an IEEE Solid State Circuits Society Distinguished
Lecturer, a board member of the ACM Interest Group on Design Automation, and an Associate Editor of the IEEE Transactions on Computer Aided Design. His current work focuses on devel-oping design methodologies and techniques for low power electronics, power conversion and regulation, and timing, power, and temperature analysis of CMOS VLSI circuits.

Reducing Energy Cost and Carbon Footprint of Data Centers

This talk starts by describing modern enterprise server designs, which utilize chip multi-processing, multiple-voltage domains, dynamic voltage scaling, and power/clock gating techniques. Next techniques for improving performance per Watt of large-scale enterprise information processing and management systems are discussed, which include multi-agent dynamic power and thermal management, energy-proportional computing, and power-aware application and middleware optimizations. The talk concludes with a top-ten list of strategies for greening a high-density data center.

Zhihua Wang

Zhihua Wang

Professor, Deputy Director
Institute of Microelectronics, Tsinghua University

Biography

1983: Bachelor of Science in Electronic Eng, Tsinghua University, P. R. China
1985: Master of Science in Electronic Eng, Tsinghua University, P. R. China
1990: Ph. D. in Electronic Eng. , Tsinghua University
1997- Now, Full professor , Tsinghua University, China
1994-1997, Associate professor, Tsinghua University, China
1993-1994, Visiting free researcher, K.U. Leuven, Belgium
1992-1993, Visiting scholar, Carnegie Mellon University, USA
1988-1992, Senior lecturer , Tsinghua University, China
1983-1988, Assistant Professor , Tsinghua University, China

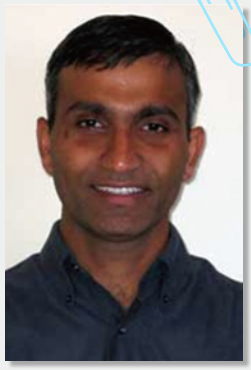
Professor Zhihua Wang is an official member of China National Commission of URSI since 2000. He is the founder of IEEE Solid-State Circuit Society Beijing Chapter and served as the Chapter Chairman since 2000. He is a senior member of IEEE and served as a Technologies Program Member of ISSCC (International Solid State Circuit Conference) for the years of 2005, 2006, 2007 and 2008. He is also the Deputy Chairman of Beijing Semiconductor Industries Association and ASIC Society of Chinese Institute of Communication, as well as Deputy Secretary General of Integrated Circuit Society in China Semiconductor Industries Association. He is the member of expert committee of the National High Technology Research and Development Program of China (863 Program) in information science and technologies area. His research interests include design methodology of integrated circuits and systems, lower power analog and RF ICs for Medical and communication, high-speed real-time signal processing. In his more than 25 years of academia experience, he has published over 170 academic papers, 3 books, filed more than 25 patents, and accomplished over 15 research projects.

A varieties of research and development on analog/RF circuits and SoC which including design for testability of analog/RF IC, design of RF module and system by using CMOS technology, high speed, low power SoC design for digital signal processing and biomedical application.

Case study for the Medical electronics and integrated circuits

The research and development activities in the field of medical electronics and integrated circuits at Institute of Microelectronics of Tsinghua University are given in this presentation. The criteria to support the selection of research topic are present first. The requirements for the integrated circuits used for the medical application are addressed. A few carrying on projects used for in medical application are presented. The projects include the IC design for the smart capsule, retina implants, cochlear implants and hear aids.

Murali Annavaram



Murali Annavaram

Biography

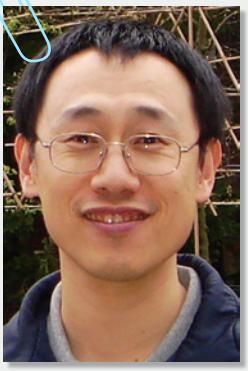
Ph.D. in Electrical Engineering and Computer Science, 2001, University of Michigan. Murali Annavaram is an Assistant Professor in the Ming Hsieh Department of Electrical Engineering at USC. Prior to his appointment at USC he was a visiting research faculty at Nokia Research Center Palo Alto. His research at Nokia focused on exploring features required for mobile devices in order to provide location and context-aware computing services. Prior to Nokia he was a senior research scientist at Intel Microprocessor Research Labs where his research spanned the entire spectrum of systems architecture ranging from high level software issues to low level device variations. His research at Intel focused on a wide range of topics: 3D stacking, EPI throttling for power efficient CMP designs, impact of process variability on chip designs, characterizing server workloads for improving simulation and tracing technologies. Murali received his PhD from University of Michigan in 2001 focusing on prefetching techniques for irregular application. Murali enjoys hiking, running, and best of all traveling around the world with his wife and three year old handful!

Improving the reliability of data center servers using 3D stacked monitoring

As process technologies continue to scale to smaller dimensions, processor reliability is becoming a new design challenge. Reliability degradation manifests as premature wear-out, timing margin degradation and transient errors. This paper focuses on one manifestation of reliability degradation, namely temperature induced timing margin degradation. Increasing thermal density on a chip leads to several hotspots, particularly near the execution units, which in turn degrades timing margin.

We propose Reliability3 (Reliability cube) architecture that uses 3D stacking to improve chip reliability, where timing critical functional unit blocks (FUBs) are selectively stacked using 3D technology. The improved reliability comes from the fact that the stacked FUBs are built on a reliable technology node that is potentially slower than the high-performance FUB. We recognize the important fact that timing margin degradations occur slowly over time. The novelty of Reliability3 is that the reliable components act as additional resources to improve performance in the common case and act as verification units when an error is likely to occur. 3D stacking makes such a flexible design feasible since heterogeneous technology nodes can be integrated into a single process flow.

We present three key microarchitectural blocks used in Reliability3 architecture. We use a combination of HSPICE simulations, cycle accurate software simulations and emulating circuit design on FPGAs to evaluate our design. We compare Reliabiliity3 with DVFS approach to show that Reliability3 pays less than 0.5% performance penalty, whereas DVFS pays penalties as high as 106% in the worst case.



Wenguang Chen

Wenguang Chen

Professor, Department of Computer Science
Tsinghua National Lab for Information Science and Technology
Tsinghua University

Biography

Wenguang Chen received the B.S. and Ph.D. degrees in computer science from Tsinghua University in 1995 and 2000 respectively. He was the CTO of Opportunity International Inc. from 2000-2002. Since January 2003, he joined Tsinghua Univeristy. He is now a professor and dupty head in Department of Computer Science and Technology, Tsinghua University. His research interest is in parallelizing compiler, programming model, computer system performance analysis and bioinformatics.

Energy-aware schedulers for HPC clusters

The utilization of HPC clusters is not always high, indicating that there is a huge space to conserve energy consumption with more intelligent energy management scheme. Although there has been some energy conservation schemes proposed for web clusters, they are not applicable to HPC clusters. We propose a dynamic energy conservation scheme for HPC clusters. The scheme is to turn some cluster nodes on and off dynamically according to the current and historical workload. The goal is to reduce the energy consumption of clusters with minimal performance loss. We evaluate our scheme by simulation and show that it can effectively conserve energy consumption.

Viktor Prasanna


Viktor Prasanna

Biography

Ph.D. in Electrical Engineering, 1983, Penn State, State College, PA. Viktor K. Prasanna (V. K. Prasanna Kumar) received his BS in Electronics Engineering from the Bangalore University, MS from the School of Automation, Indian Institute of Science and Ph.D. in Computer Science from the Pennsylvania State University. He is the Steering Committee Co-Chair of the IEEE/ACM International Parallel & Distributed Processing Symposium (IPDPS) [merged IEEE International Parallel Processing Symposium (IPPS) and Symposium on Parallel and Distributed Processing (SPDP)]. He is the Steering Committee Chair of the International Conference on High Performance Computing (HiPC). In the past, he has served on the editorial boards of the IEEE Transactions on VLSI, IEEE Transactions on Parallel Distributed Systems, Journal of Pervasive and Mobile Computing, and the Proceedings of the IEEE. During 2003-06, he was the Editor-in-Chief of the IEEE Transactions on Computers. He serves on the editorial boards of the Journal of Parallel and Distributed Computing, ACM Transactions on Reconfigurable Technolgy and Systems, and Springer Transactions on Computational Science. He was the founding chair of the IEEE Computer Society Technical Committee on Parallel Processing. He is a Fellow of the IEEE and the ACM. He is a recipient of the 2005 Okawa Foundation Grant.

Greening the Internet: Towards Design of Energy Efficient and High Throughput Routers

This talk explores architectures and algorithms for network functions including deep packet inspection and packet classification in core routers. We propose energy efficient designs to realize the “Green Internet” vision. We show that FPGA based architectures using external SRAMs lead to high throughput as well as reduced power dissipation compared with the state of the art solutions based on TCAMs. We illustrate the performance improvements for such systems and demonstrate the suitability of FPGAs for these applications.

Dong Xiang

Dong Xiang

Professor, School of Software

Biography

Prof. Dong Xiang held his B. S. and M. S. degree in Computer Science from Chongqing University in 1987 and 1990, respectively. He got his Ph.D degree in Computer Engineering from the Institute of Computing Technology, the Chinese Academy of Sciences in 1993. He visited Concordia University, Canada as a Postdoctor from 1994 to 1995, and the Coordinated
Science Lab., University of Illinois, Urbana Champaign from 1995 to 1996. He was with Institute of Microelectronics, Tsinghua University as an Associate Professor from 1996.10 to 2003.3. He moved to School of Software, Tsinghua University Mar. 2003. He is now a Professor of the School of Software, Tsinghua University. He was with Nara Institute of Science and Technology, Nara, Japan as a JSPS invitation fellow from Apr. 2003 to Sept. 2003. He is a Senior Member of IEEE. His research interests includeDesign and test of digital systems: design for testability, testability analysis, low-cost testing techniques, built-in self-test, test generation; fault-tolerant computing, parallel/ distributed computing, and computer networking.

Deadlock-Free Fully Adaptive Routing in 2D Tori

A new deadlock-free fully adaptive routing algorithm is proposed for 2D tori with only two virtual channels. The deadlock avoidance technique is presented based on a new virtual network partitioning scheme. The proposed virtual network partitioning scheme can avoid all potential deadlocks and provides fully adaptive routing. Enough theoretical analyses on the proposed virtual network partitioning scheme are presented. Sufficient simulation results are presented to demonstrate the effectiveness of the proposed algorithm by comparing with the previous methods.

Track III: Smart Power Grid and Urban Infrastructure

C.-C. Jay Kuo

C.-C. Jay Kuo

University of Southern California

Biography

Dr. C.-C. Jay Kuo received the Ph.D. degrees from the Massachusetts Institute of Technology in 1987. He is now with the University of Southern California (USC) as Director of Signal and Image Processing Institute and Professor of EE, CS and Mathematics. His research interests are in the areas of digital media processing, multimedia compression, communication and networking technologies, and embedded multimedia system design. Dr. Kuo is a Fellow of IEEE and SPIE. Dr. Kuo has guided about 90 students to their Ph.D. degrees and supervised 20 postdoctoral research fellows. Currently, his research group at USC consists of around 35 Ph.D. students (see website http://viola.usc.edu), which is one of the largest academic research groups in multimedia technologies. He is a co-author of about 140 journal papers, 740 conference papers and 9 books.

Dr. Kuo is Editor-in-Chief for the Journal of Visual Communication and Image Representation, and Editor for the Journal of Information Science and Engineering, LNCS Transactions on Data Hiding and Multimedia Security (a Springer journal), the Journal of Advances in Multimedia (a Hindawi journal) and the EURASIP Journal of Applied Signal Processing (a Hindawi journal). He was on the Editorial Board of the IEEE Signal Processing Magazine in 2003-2004. He served as Associate Editor for IEEE Transactions on Image Processing in 1995-98, IEEE Transactions on Circuits and Systems for Video Technology in 1995-1997 and IEEE Transactions on Speech and Audio Processing in 2001-2003.

Design of Smart Power Grid Systems: Issues and Opportunities

In this research, we attempt to draw a comparison between the power delivery network and today's information network infrastructure and highlight their similarities and differences. The purpose is to leverage some experience learned from the management of information networks for the design of a smart power delivery grid system. Fault-tolerance, distributed routing, flow control, queuing and buffer management (or temporary storage) are all shared common features of both types of networks. As a result, mathematical tools such as graph theory, queuing theory and network optimization can be applied to the design of a more efficient power grid system. We will share some of our preliminary studies on this topic.

Zongxiang Lu

Zongxiang Lu

Department of Electrical Engineering, State Key Lab of Power Systems
Tsinghua University,

Biography

Zongxiang Lu graduated and got his D.E. degrees from Tsinghua University, Beijing, China, in 2002. Now he is associate professor of Electrical Power System Institute of Electrical Engineering Department and also a faculty of State Key Lab of Control and Simulation of Power Systems and Generation Equipments. And his special fields of interest included power system reliability, distributed generation and wind power integration, microgrid, smart grid and future vision of Chinese power system. Dr. Lu is a member of the IEEE, member of reliability technical committee of CSEE(Chinese Society for Electrical Engineering), and member of CNPCCIE(China National Petrolic and Chemical Industry Electric Technical Council).

Research Activities and Technical Roadmap of Green Electric Grid in China

Human will face a shortage of traditional energy resources and aggravating environment in the 21st century. In this condition, the protection of energy security and response to the climate change has become the two core objectives of the energy strategy for most of the countries in the whole world. Developing cleaner fossil fuels, renewable energy and electricity grids becomes one of the five key targets proposed in “GLENEAGLES PLAN OF ACTION: CLIMATE CHANGE, CLEAN ENERGY AND SUSTAINABLE DEVELOPMENT”.A smart grid integrates new innovative tools and technologies from generation, transmission and distribution all the way to consumer appliances and equipment.

In this talk, our three part of research activities to reach green electrical grid in China are introduced. First research is the technical roadmap of State Grid Company in 2030 which focus on the visions and ways to reach them. Enabling technologies in electricity generation, delivery and end-use are analysis in detail. The second research is focus on the microgrid concepts suitable for China. The microgrid concept has been adopted widely in developed countries as an effective solution for various power systems problems. The potential of microgrid in promoting energy efficiency and facilitate the introduction of renewable energy resources have attracted lots of attention from many scientists all over the world. The marketability and possibility of microgrid systems in China are analyzed in this research project. The third research project focus on electrical energy as an alternative energy source for automobile. The development of electric vehicles has become an important trend in automotive industry of developed countries. Moreover, as a new type of load, the electric vehicles could have a significant impact on grid operation when they develop massively. So we must consider the EV development status when we predict the vision of future Chinese electrical power system and several scenarios are proposed in the research.

S. Joe Qin

Biography

Dr. S. Joe Qin is the Fluor Professor of Process Engineering at the Viterbi School of Engineering at the University of Southern California and the Chang Jiang (Guest Chair) Professor affiliated with Tsinghua University appointed by the Ministry of Education of China. He obtained his BS and MS degrees in Automatic Control from Tsinghua University in Beijing, China, in 1984 and 1987, respectively, and his Ph.D. degree in Chemical Engineering from University of Maryland in 1992. Prior to joining the faculty at the University of Southern California he was a professor at the University of Texas at Austin from 1995 to 2007 and a Principal Engineer at Fisher-Rosemount from 1992 to 1995.

Dr. Qin's research interests include system identification, process monitoring and fault diagnosis, model predictive control, run-to-run control, semiconductor process control, and control performance monitoring. He is a recipient of the National Science Foundation CAREER Award, DuPont Young Professor Award, Halliburton/ Brown & Root Young Faculty Excellence Award, NSF-China Outstanding Young Investigator Award, and an IFAC Best Paper Prize for the model predictive control survey paper published in Control Engineering Practice. He is currently an Associate Editor for Journal of Process Control and a Member of the Editorial Board for Journal of Chemometrics. He served as an Editor for Control Engineering Practice and an Associate Editor for IEEE Transactions on Control Systems Technology.

Model Predictive Control for Electricity Demand Reduction in Commercial Buildings

This talk focuses on developing a dynamic, real-time control and optimization strategy to shift electricity demand in commercial buildings to reduce peak time consumption. Unmeasured real time disturbances are predicted and incorporated in the optimal strategy using the framework of model predictive control (MPC).

Xiaohui Cheng

Xiaohui Cheng

Associate Professor
Dept of Civil Engineering

Biography

Year of birth: 1971, Nationality: China
Social Status:Married
Degrees:
1989-1994 B.Sc, Dept of Civil Engineering, Tsinghua University, Beijing
1994-1997 M.Sc (structural engineering) Dept of Civil Engineering,Tsinghua University, Beijing,
2000-2004 PhD (localization in soil mechanics) Faculty of Civil Engineering and Applied Geosciences, Delft University of Technology, Delft, the Netherlands
Working experience:
1997-1999 teaching assistant and lecturer, Dept of Civil Engineering, Tsinghua University, Beijing
1999-2000 visiting scholar at Blasé Pascal University, France
2004-2006 research associate, Faculty of Civil Engineering and Applied Geosciences, Delft University of Technology, Delft, the Netheralands
2007-present, lecturer and associate professor, Dept. of Civil Engineering, Tsinghua University,Beijing
Research interests:
Geomechanics from micro to macro, BioGeoCivil engineering, Mechanics of granular materials, Risk management in ground engineering, Foundation Engineering

A Research Initiative: eRUCIE: e-Leaning Network on Risk-managed Underground Civil Infrastructure Engineering

The proposed action pays special attention to intensify the cooperation between civil engineers and IT professionals to promote modern research and education in China through an initiative of collaborative e-Learning on Risk-managed Underground Civil Infrastructure Engineering (eRUCIE). It aims to initialize a joint virtual institute of research and education in eRUCIE with the focus on transfer of experience and expertise using IT technologies. This proposal comprises the development and integration of two modules: e-Experience and e-Experiment, in an e-Learning environment with a focus on multi-disciplinary knowledge structure and transfer for enhancing safety and sustainability of the underground infrastructure. It will firmly embed the concept of integral risk assessment in the traditional education, and it will allow the two modules, which include risk analysis tools and validated techniques in sensing the underground, to be taught to younger generations by showcases. The created collaborative e-Learning environment will demonstrate in the two modules e-Experience and e-Experiment the following key elements: Expert Judgement, Wireless-Sensor Networks and promoting Internet work-shopping. It will provide location independent knowledge sharing and exploration, and allow for efficient real time data processing. One can expect from the proposed action that trained lecturers, scientists, engineers and students gain valuable experience and expertise in the wake to globalisation with regard to IT technologies. They will be able to better act to improving safety and reducing potential malfunctioning during construction and operation of underground civil infrastructures.

Andrea Armani


Andrea Armani

Biography

Andrea Armani received her BA in physics from the University of Chicago and her PhD in applied physics with a minor in biology from the California Institute of Technology, where she continued as the Clare Boothe Luce post-doctoral Fellow in biology and chemical engineering. She is currently an Assistant Professor of Chemical Engineering and Materials Science and Electrical Engineering-Electrophysics in the Viterbi School of Engineering at the University of Southern California. She has received numerous awards, including the Sigma Xi award for excellence in research (2001), the Dean's Award for Community Service (2007), the SPIE BiOS Young Investigator Award (2008) and ONR Young Investigator Award (2009).

Online sensor networks for dynamic control

One real-time sensor application which has been demonstrated is in-line networked sensors for monitoring energy consumption to optimize energy usage. A similar system for chemical and biological sensors has yet to be implemented. Currently, the majority of water supply and air monitoring is performed off-line. If this detection speed was performed in real-time, the contaminant detection rate would be accelerated, improving response rate. Recent results concerning airborne allergen detection will be discussed.

Li Li

Li Li

Assistant Professor, Department of Automation
Tsinghua National Lab for Information Science and Technology
TSINGHUA UNIVERSITY

Biography

Li Li, joined Department of Automation, Tsinghua University as an Assistant Professor in 2006. He is currently an Associate Professor at the same department, working in fields of complex systems, intelligent control and sensory, intelligent transportation systems and intelligent vehicles.

ITS in China: Our Viewpoints and Recent Research Progress

In this report, we will first provide an overview for the ITS research problems in China. Then, we will birefly introduce the research interests of different ITS/IV groups in Tsinghua University. Finally, we will summarize the recent ITS research works of our group.

Track IV: Mobile Sensor Networks for Energy Efficiency

Andreas Molisch

Andreas Molisch

Biography

Andreas F. Molisch received the Dipl. Ing., Dr. techn., and habilitation degrees from the Technical University Vienna (Austria) in 1990, 1994, and 1999, respectively. From 1991 to 2000, he was with the TU Vienna, becoming an associate professor there in 1999. From 2000-2002, he was with the Wireless Systems Research Department at AT&T (Bell) Laboratories - Research in Middletown, NJ. From 2002-2008, he was with Mitsubishi Electric Research Labs, Cambridge, MA, USA, most recently as Distinguished Member of Technical Staff and Chief Wireless Standards Architect. Concurrently he was also Professor and Chairholder for Radio Systems at Lund University, Sweden, and Deputy Director of the National Center of Excellence for High-Speed Wireless Communications.

Dr. Molisch has authored, co-authored or edited four books (among them the textbook "Wireless Communications, Wiley-IEEE Press), eleven book chapters, more than 110 journal papers, and numerous conference contributions, as well as more than 70 patents. He has been an editor of a number of journals and special issues, General Chair, TPC Chair, or Symposium Chair of multiple international conferences, and chairman of various international standardization groups. He is a Fellow of the IEEE, a Fellow of the IET, an IEEE Distinguished Lecturer, and recipient of several awards.

Sensor Networks for energy-saving applications: physical-layer and cross-layer aspects

in order to implement monitoring and control, it is required to implement reliable, low-latency communications capabilities between control centers and the actual energy-using devices. In most cases, the communication takes place over wireless links, in order to keep deployment costs low. However, the requirements for these wireless links are different from traditional wireless systems like cellphones and wireless LANs: namely, the requirements for the reliability can be orders of magnitude more stringent. This talk will give an overview of physical-layer and cross-layer approaches to achieve this high reliability in various applications (building monitoring and control, traffic monitoring, smart grid).

Lin Zhang

Lin Zhang

Associate Professor, Ph.D.,
Director, Tsinghua(EE)–CISCO Joint Research Lab for Green Technology,
Deputy Director, Electronic Engineering Department,
Tsinghua University,

Biography

Lin Zhang received the B.Sc from the Electrical Engineering Department, in 1998, and the M.Sc. and Ph.D. from Electronic Engineering Department in 2001 and 2006, respectively, all from Tsinghua University, Beijing, China. He is currently an associate professor at Tsinghua University, and the deputy director of the Department of Electronic Engineering, Tsinghua University. From April to November, 2004, he was a visiting assistant professor at the University of Hong Kong. His current research interests include wireless networks, distributed data fusion, and the information theory.

Since 2001, he has been teaching the Selected Topics in Communication Networks(40230992) and the Information Theory(70230063) to senior undergraduate students and graduate students, respectively. In 2004, he received the Excellent Teacher Award from Tsinghua University. Since 2001, he has been leading two National Science Foundation of China projects, three National High-tech Developing (863) projects, and more than 10 research projects from industry as the Principle Investor. He was the IEEE ICC 2008 publication chair and served many major international conferences and journals as reviewers or TPC members. He is a co-authors of more than 20 technical papers and 5 US or Chinese patents applications.

ASON: Metropolitan Area Sensing and Operation Network

Although the Wireless Cellular Networks have been widely deployed, and acted as the infrastructure for speech and data communications in the metropolitan area, they are not suitable for sensing and actuation applications. The specific requirements for sensing and actuation applications in big cities can be itemized as following with a descending order of significance.

1. Large number of nodes
2. Low costs
3. Strong delay tolerance
4. Immunity to network component failures
5. Low energy consumption

To meet the requirements, utilizing the currently available wireless cellular network is not a good solution. First, given the large number of sensors and actuators to be networked, the cost for equipping cellular data modem to each node is prohibiting high. Second, the data traffic in the sensing and actuation applications in cities, such as air pollution monitoring, remote metering, is delay tolerant and sparse in time and space, using the wireless cellular network that supports real-time audio and data applications is a waste of resources.

We exploit a new method to establish a wireless infrastructure for the delay tolerant sensor data traffic, namely the Metropolitan Area Sensing and Operation Network (MASON), and establish a prototype of it. The ant is an animal without chief and central control in the foraging activities. Our proposed MASON system will mimic the ants' behavior and convey data traffic in a new distributed way. MASON composes of small and affordable communicators mounted to cars and persons. When two communicators run into each other, they exchange data over a short range wireless link, and the data eventually spread out over the entire network. When a communicator

reaches the coverage area of an available hotspot, all data it holds could be uploaded to a server, processed and ported to Internet. In this way, MASON provides a new method to convey delay-tolerant data traffic with very low power consumption and affordable prices. And MASON also composes a parallel infrastructure to the existing wireless cellular networks that better fit the future metropolitan sensing and actuation applications.

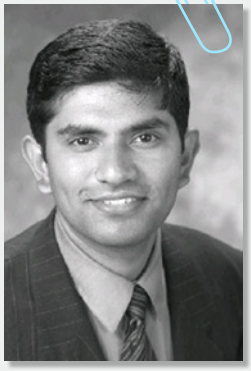
The relation between the fundamental research and this demonstration system is bi-fold.

First, the routing algorithms in sparse distributed wireless sensor networks and energy efficient scheme developed in the fundamental research will be implemented and tested in the field experiment. Since the delay is not critical, the whole network can be categorized as the Delay Tolerant Network (DTN). The data collected by the sensor nodes do not require an immediate transmission to the server. Instead, they could be diffused slowly in the network until some nodes holding the data reach a base station. This scheme could significantly reduce the energy dissipation in the network.

Second, the data processing and fusion methods that we achieve in the fundamental research could be applied in the system to eliminate the erroneous data caused by transmission error or sensor node failure.

MASON could serve as a parallel wireless infrastructure for future city management. Its inherent distributed operation manner offers high robustness and immunity to network components failure, and makes it a new infrastructure for emergency communication that is free of operation charge. Based on the MASON prototype built in the project, a demo for future distributed air pollution monitoring system will be established.

Bhaskar Krishnamachari



Bhaskar Krishnamachari

Biography:

Bhaskar Krishnamachari is MacDonald Early Career Chair Assistant Professor in the Ming Hsieh Electrical Engineering department of the Viterbi School of Engineering at the University of Southern California. He obtained his B.E. in Electrical Engineering at The Cooper Union in New York City in 1998. He obtained his M.S. in 1999 and his Ph.D. in 2002 also in Electrical Engineering from Cornell University. His research interests are in design and performance analysis of protocols for wireless networks. He received the USC Viterbi School of Engineering Junior Faculty Research Award in 2005 and the NSF CAREER award in 2004. He has received best papers awards at IPSN 2004 and MSWiM 2006. He serves as an editor for the IEEE Transactions on Mobile Computing, the Elsevier Ad Hoc Networks Journal, and the ACM Mobile Computing and Communications Review. He is the author of a book titled Networking Wireless Sensors, published by Cambridge University Press.

City Scale Sensor Networks

The initial visions of sensor networks that have driven the growth of a rich research area in the past ten years have largely centered around flat networks of miniature devices forming somewhat separate networks for localized applications. Recently, a newer, broader, vision of sensor systems has emerged. In this vision, sensors will be deployed and utilized at the scale of entire cities and communicate through a heterogeneous mix of communication infrastructures; besides novel distributed multi-hop and vehicular contact-based communication protocols, they can also take advantage of existing cellular, wifi and the wired Internet infrastructure. Such networks will allow the intelligent monitoring of various aspects of the physical environment, including air, water and soil quality, road, traffic, and parking conditions, social contacts, vegetation, temperature, humidity, lighting conditions, real-time mapping, energy availability and utilization, etc. They will form the fundamental basis of a new green era of intelligent resource utilization in urban environments. I will describe the many research challenges involved in realizing and integrating such city scale sensor networks, and discuss the potential for collaboration between Tsinghua University and USC in this domain.

Track V: Nanotechnology and Energy Conversion

Chongwu Zhou

Chongwu Zhou

Jack Munushian Associate Professor, Department of Electrical Engineering
University of Southern California
Los Angeles, California, USA

Biography

Dr. Zhou is an Associate Professor at the University of Southern California (USC). He received Ph.D. in Electrical Engineering from Yale University in 1999. He worked as a postdoc at Stanford University before he joined USC as an assistant professor in 2000. Dr. Zhou has authored 102 journal publications with altogether ~ 7200 citations, and his work has been reported by Science, Scientific American, Physics Today, MRS Bulletin, Materials Today, National Cancer Institute, and Royal Society of Chemistry. He is currently an Associate Editor for IEEE Transactions on Nanotechnology. His research interest covers carbon nanotubes, nanowires, and bionanotechnology. He has won a number of awards, including the NSF CAREER Award (2002), the NASA TGIR Award (2002), the USC Junior Faculty Research Award (2004), and the first IEEE Nanotechnology Early Career Award (2007).

Green Energy Conversion and Storage Based on Novel Nanomaterials

Nanoscale materials rank among the most exciting new developments in modern science and engineering. This talk will focus on our recent work on green energy conversion and storage enabled by novel nanomaterials. We have developed novel solar cells based on heterostructured nanowires that promise to offer high performance and low cost. In addition, we have designed, fabricated and evaluated novel lithium ion batteries and super capacitors based on nanowires and carbon nanotubes for high capacity energy storage, which may impact applications from portable electronics to electric vehicles.

Yidong Huang

Professor,
Deputy Director, Electronic Engineering Department,
Tsinghua University,

Yidong Huang

Biography

Yidong Huang was born in Beijing, China. She received the B.S. and Ph.D. degrees in optoelectronics from Tsinghua University, Beijing, China, in 1988 and 1994, respectively. From 1991 to 1993, she was with Arai Laboratories, Tokyo Institute of Technology, Japan, on leave from the Tsinghua University. Her Ph.D. dissertation was mainly concerned with strained quantum well lasers and laser amplifiers. In 1994, she joined the Photonic and Wireless Devices Research Laboratories, NEC Corporation, where she was engaged in the research on semiconductor laser diodes for optical-fiber communication and became an assistant manager in 1998. She received "Merit Award" and "Contribution Award" from NEC Corporation in 1997 and 2003, respectively. In 2003, she joined the Department of Electronics Engineering, Tsinghua University, as a professor and has been Vice Chairman of the Department of Electronics Engineer from 2007. She is presently engaged in research on nano-structure optoelectronics.
Professor Huang is a member of the IEEE.

Passive and Active Performances of Slab Photonic Crystal Waveguides

Photonic crystal (PC) slabs, which are normally made by periodically patterning an array of air holes in slabs with high refractive index material, have received considerable attention in recent years for its in-plane band-gap and compatible fabrication method with the traditional semiconductor wafer process. Inducing a line defect to the slab PC would form a band gap confinement PC waveguide (PCWG), which is the fundamental part of most PC based devices. This paper reviews our present research work on the PCWG. A 2D slab PCWG was designed and fabricated with traditional strip waveguides for joint. By measuring the transmission spectra, full photonic band gap, band gap guided mode, and index guided mode were observed near 1.55 m. Mini-stop-bands in the PCWG were discussed with different structure parameters. It is found that their centre frequency is very sensitive to the refractive index of the substance filled in the holes of PC. Coupling characteristics and gain performance of PCWG were also investigated.

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Biography

Jia Grace Lu received her dual B.S. degrees in Physics and Electrical Engineering from Washington University in 1992, and Ph.D. degree in Applied Physics from Harvard University in 1997. Currently she is in the Department of Physics at USC, with a joint appointment in the Department of Electrical Engineering and Computer Science. Her research focuses on nano materials, devices, and systems, including bottom-up and top-down synthesis, characterization of fundamental physical properties, and their future applications.

Physical Properties of Semiconductor and Metallic Nanowires

In this presentation, I will describe the work carried out in our group on studying various semiconductor and metallic nanowires for future smart and green device applications. One project is on metal oxide nanowires, using zinc oxide as an example. I will present the fundamental characterizations, electrical, optical and magnetic properties; and electronic devices based on them, including field effect transistor, chemical sensor, optical switch, and solar cells. Another example is the magnetic nanowires/nanotubes based on cobalt. Their synthesis, crystalline structure and unique magnetic signatures will be illustrated; and low power magneto-electronic devices such as spin injector, voltage controlled oscillator, and patterned medium.