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Keynote Lecture 1

Multihop Cellular Networks: Integration, Cooperation, Standardization, Research Challenges

Professor Zoran Bojkovic
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Abstract: Cellular networks have been developed for voice telephone service using circuit switched technology.They are usually complex and large in terms of their network scale and operational features,high speed mobility,low data rate, and wide area coverge..The aim of the process of cellular networks evolution is to have an all IP network architecture to provide high bit rate multimedia services including voice,audio, video and data. Multimedia services require multiple sessions over one physical channel which could be provided by packet switched networks. The common protocol is IP.The Internet and cellular systems have been designed and implemented by people with different backgrounds in computers and communications, respectively.Their integration can be considered a first step toward next generation networks, where heterogeneous nettworks must work together in order to provide differential services to users in seamless and transparent manner. Next generation cellular networks are expected to provide richer and more diverse multimedia services. However,the current cellular network architecture may not be economically feasible to cater to the requirements of future mobile communication services.As an alternative to cellular communications, ad hoc networking is a wireless communication technology distinguished
by communicating via multihop transmissions. The multihop cellular network(MCN) which combines the characteristics of ad hoc networking with these of a cellular network,has been drawing a lot of attention. Namely, MCN incorporates the flexibility of ad hoc networking,while preserving the benefits of using an infrastructure.The advantage of using MCN includes capacity enhancement,coverage extension,network scalability, and power reduction.The main motivation for integrating multihop transmission in cellular networks is to enhance coverage and network capacity. Relaying can be used to assist communications to and from mobile hosts (MHS) at the cell edge or MHs experiencing deep fading in their home base station (BS). This presentation starts with the background of the problem.Next,integration of cellular and internet services including a cooperation in multihop cellular networks will be analyzed.Some examples will be included,too. Finally, 4G cellular standards,together with research challenges conclude the lecture. It is pointed that there are still a number of open research issues that need to be solved in order to provide an efficient and effective multihop transmissions in cellular networks in the future.

Brief Biography of the Speaker:
Prof. Dr. Zoran Bojkovic (http://www.zoranbojkovic.com) is a full professor of Electrical Engineering at the University of Belgrade,Serbia and a permanent visiting professor at the University of Texas at Arlington, TX, USA, EE Department, Multimedia System Lab. He was a visiting professor in more than 20 Universities worldwide and has taught a number of courses in Electrical Technology, Telecommunication Systems and Networks, Speach, Image and Video Processing, Multimedia Wire/Wireless Communication Systems, Computer Networks. Prof. Bojkovic is the co-author of 6 international books/monographies (Publishers: Prentice-Hall, Wiley, CRC Press, WSEAS) Also, some of these books have been published and translated in Canada, China, Singapore and India. He is co-editor in 62 International Books and Conference Proceedings. He has published more than 420 papers in peer-reviewed journals, conference proceedings and publications.He has conducted keynote/plenary lectures, workshops/tutorials as well as seminars , and participated in more than 70 scientific and industrial projects all over the world.He has been a consultant to industry research institutes and academia. His activities included serving as Editor- in- Chief in 2 International Journals and as Associate Editor in 3 International Journals. Prof. Zoran Bojkovic is an active researcher in wire/wireless multimedia communications. He is a Senior Member of IEEE and WSEAS, member of EURASIP, full member of Engineering Academy of Serbia as well as a member of Serbian Scientific Society.

Keynote Lecture 2

Program Analysis and Optimization for Multi-core Computing

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Abstract: As multi-core architectures become ubiquitous in modern computing, large scale scientific applications have to be redesigned to efficiently use the multiple cores and deliver higher performance. One major approach is the automatic detection of parallelism, in which existing conventional sequential programs are translated into parallel programs by optimizing compilers, in order to take advantage of the multiple processors. Optimizing compilers rely upon program analysis techniques to detect data dependences between program statements, perform optimizations, and identify code fragments that can be executed in parallel. In this work we study various program analysis and optimization techniques for multi-core computing and measure their impact in practice. We perform an experimental evaluation of several data dependence tests and program analysis techniques and we compare them in terms of data dependence accuracy, compilation efficiency, effectiveness in parallelization and program execution performance. We run various experiments using the Perfect Club Benchmarks, the SPEC benchmarks, and the scientific library Lapack. We present the measured accuracy of each data dependence test and explain the reasons for inaccuracies. We compare these tests in terms of efficiency and we analyze the tradeoffs between accuracy and efficiency. We also determine the impact of each data dependence test on the total compilation time. Finally, we measure the number of loops parallelized by each test and we compare the execution performance of each benchmark on a multi-core architecture.

Brief Biography of the Speaker:
Kleanthis Psarris is Professor and Chair of the Department of Computer Science at the University of Texas at San Antonio. He received his B.S. degree in Mathematics from the National University of Athens, Greece in 1984. He received his M.S. degree in Computer Science in 1987, his M.Eng. degree in Electrical Engineering in 1989 and his Ph.D. degree in Computer Science in 1991, all from Stevens Institute of Technology in Hoboken, New Jersey. His research interests are in the areas of Parallel and Distributed Systems, Programming Languages and Compilers, and High Performance Computing. He has designed and implemented state of the art program analysis and compiler optimization techniques and he developed compiler tools to increase program parallelization and improve execution performance on advanced computer architectures. He has published extensively in top journals and conferences in the field and his research has been funded by the National Science Foundation and Department of Defense agencies. He is an Editor of the Parallel Computing journal. He has served on the Program Committees of several international conferences including the ACM International Conference on Supercomputing (ICS) in 1995, 2000, 2006 and 2008, the IEEE International Conference on High Performance Computing and Communications (HPCC) in 2008, 2009, and 2010, and the ACM Symposium on Applied Computing (SAC) in 2003, 2004, 2005 and 2006.

Keynote Lecture 3

Biomimetic Human Modeling, Simulation and Control

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Abstract: For use in the entertainment industry, computer graphics/animation has made significant strides over the past two decades through advances in physics-based simulation and control. In this context, one of the most difficult open challenges going forward is the biomimetic simulation and control of the human body. This talk will present our progress toward a comprehensive simulator that confronts the combined challenge of biomechanically modeling and neuromuscularly controlling more or less all of the relevant articular bones and muscles in the body, as well as simulating the physics-based deformations of the soft tissues. A significant component of our model is the neck-head-face complex, which addresses the important role that the neck plays in synthesizing the head movements that are essential to so many aspects of human behavior. Our anatomically consistent biomechanical model confronts us with many challenging motor control problems, even for the relatively simple task of balancing the mass of the head in gravity atop the cervical spine. I will present a neuromuscular control model that emulates the relevant biological motor control mechanisms. Employing machine learning techniques, the neural networks within our controllers may be trained offline to efficiently generate the pose and stiffness control signals needed to synthesize a variety of autonomous human movements. The talk will be richly illustrated with images and videos.

Brief Biography of the Speaker:
Demetri Terzopoulos (PhD '84 MIT) is the Chancellor's Professor of Computer Science at the University of California, Los Angeles. He is a Guggenheim Fellow, a Fellow of the ACM, IEEE and Royal Society of Canada, and a Member of the European Academy of Sciences. Among his many honors are an Academy Award for Technical Achievement from the Academy of Motion Picture Arts and Sciences for his pioneering work on physics-based computer animation, and the inaugural Computer Vision Significant Researcher Award from the IEEE for his pioneering and sustained research on deformable models and their applications. One of the most highly cited authors in engineering and computer science according to ISI and other indexes, his publications include more than 300 research papers and several volumes, primarily in computer graphics, computer vision, medical imaging, computer-aided design, and artificial intelligence/life. He has given over 400 talks internationally on these topics, among them about 100 distinguished, keynote, and plenary addresses. Before joining UCLA in 2005, Dr. Terzopoulos held the Lucy and Henry Moses Endowed Professorship in Science at New York University and was Professor of Computer Science and Mathematics at NYU's Courant Institute of Mathematical Sciences. Previously, he was Professor of Computer Science and Professor of Electrical and Computer Engineering at the University of Toronto, where he continues to hold status-only faculty appointments.

Plenary Lecture 1

Thermoelectric Technology as Renewable Energy Source for Power Generation and Heating & Cooling Systems

Professor Noel Y. A. Shammas
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Abstract: This paper will review the latest research and current status of thermoelectric power generation, and will also demonstrate, using electronic design, semiconductor simulation and practical laboratory experimentation, the application of thermoelectric technology for use in energy harvesting and scavenging systems. Ongoing research and advances in thermoelectric materials and manufacturing techniques, enables the technology to make a greater contribution to address the growing requirement for low-power energy sources typically used in energy harvesting and scavenging systems. The concept of using thermoelectric technology to generate electrical power from waste heat in a system has been considered for some time, although the technology is often overlooked in discussions surrounding renewable energy sources. This paper will discuss how the natural environment presents a number of opportunities to utilise this technology as a renewable energy source, including the use of thermoelectric technology to generate electrical power from naturally occurring geothermal heat. The paper covers basic thermoelectric theory, construction and operation of thermoelectric devices; the main advantages and disadvantages; and highlights several current and new applications for thermoelectric power generation. The application of this technology for use in energy harvesting systems is discussed, along with suitable electronic signal conditioning techniques; boost converters; DC to DC converters; and the storage of electrical energy in supercapacitors. This discussion then leads to the design, construction and testing of a thermoelectric energy harvesting system, with typical test results for thermoelectric power generation presented. The paper then focuses on current research into improving the power generation properties of thermoelectric modules, and a novel approach using semiconductor simulation techniques is presented. A novel three dimensional model of a thermoelectric device has been created using the Technology Computer Aided Design (TCAD) semiconductor simulation package, with typical simulation results for thermoelectric power generation presented.

Brief Biography of the Speaker:
Noel Shammas is currently a Professor of Microelectronics and Solid-State Semiconductor Devices in the faculty of Computing, Engineering and Advanced Technology, Staffordshire University. He received the M.Sc and Ph.D degrees from Salford University in 1972 and 1975 respectively. Since then he lectured and researched at different universities and industry (GEC). Research work is primarily focused on Semiconductor Devices which includes mainly Power diodes, Light Emitting Diodes (LED's), Insulated Gate Bipolar Transistors, Thyristors, and Energy Harvesting Devices. Other related areas of research work includes Power Module Packaging technologies (Both Conventional Press-pack and Smart pack designs) and Series/Parallel operation of high power semiconductor devices and their interaction with external circuits.
Professor Shammas has extensive experience in both experimental and theoretical research work and is recognised internationally for his significant contribution to research in the field of Semiconductor Devices. He has published over 120 journal and conference research papers as well as several invited Keynote and Plenary Lectures, and has held several research grants from funding councils, Advantage West Midland (AWM), as well as from industry. He is a regular reviewer for many journals (including IET Proceeding Electronic devices and systems, IEEE Transactions on power electronics, and Microelectronic Reliability) and international conferences (including the European Power Electronic conference - EPE, Microelectronic conference - MIEL, Universities Power Engineering Conference-UPEC, International Symposium Power Semiconductors-ISPS, etc…). He is a member of scientific committee for many international conferences (including MIEL, EPE, WCE, WSEAS, and Microtherm) and a steering committee member for EPE, UPEC, and ISPS international conferences. He is also a book reviewer for Prentice Hall International and McGraw Hill.