



## Guest Editorial: Mobile Multimedia Communications

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The papers in this special issue represent the seven best papers from the 6th IEEE International Workshop on Mobile Multimedia Communications (MOMUC'99), which was held in San Diego, November 15–17, 1999. The scope of MOMUC'99 includes broadband wireless networking for data and multimedia, mobile multimedia systems and applications together with associated mobile computing devices, video processing and enabling software technologies. MOMUC'99 represents the sixth workshop in the series that started in Tokyo in 1993 and continued with Bristol in 1995, Princeton in 1996, Seoul in 1997, and Berlin in 1998. MoMuC has established itself as a premier forum for the presentation and discussion of new ideas and technologies in the area of wireless networking and mobile multimedia communications and computing.

The technical program consisted of 28 long and 22 short papers selected from 130 submissions. MOMUC'99 included excellent paper sessions on smart wireless systems, performance analysis, power control, mobile ad hoc networks, mobility management, mobile agents, wireless IP, wireless QOS, new wireless architectures, media access control, wireless broadband trials, adaptive wireless systems and personal area networks. We also had a first class invited program that complemented technical papers presented over three full days. Professor David Goodman (Polytechnic University) presented the keynote address on “Challenges of Mobile Multimedia Communications” and Dr. Mahmoud Naghshineh (IBM) provided the featured talk on “Pervasive Networking”. The meeting also included two lively panels on “Mobile Multimedia: An Industry Perspective” and “IP-based Mobile Telecommunications: Fact or Fiction?” rounding off what was an excellent and informative meeting.

The first three papers in this special issue on mobile multimedia communications are concerned with power control and management in wireless networks. Effective power control is essential to promote system quality and efficiency in wireless networks. In the first paper of the special issue, Goodman and Mandayam, discuss the application of microeconomic theories to power control taking into account notions of utility and pricing. Network assisted power control is introduced that maximizes utilities for users while maintaining equal signal-to-interference ratios for all users. The proposed power control algorithm is implemented via signal-to-interference ratio balancing with the assistance of the network that broadcasts the common signal-to-interference ratio target.

Mobile multimedia communication systems such as handheld and laptop devices suffer from low operation time due to their limited battery life. In the second paper, Ebert and Wolisz, introduce the concept of protocol harmonization to extend the time between battery charges for mobile devices using IEEE 802.11. This is achieved by combining tuning of the data link control and physical layer. Harmonized operation of power control and medium access control leads to a reduction in energy consumption.

In the next paper, Bambos and Kandukuri, discuss a power control scheme for wireless data networks where the transmitter performs power control over multiple wireless channels under a global constraint. A transmitter capable of transmitting packetised data traffic to different users over independent FDM channels is considered. The transmitter maintains a ceiling on the sum of powers transmitted to different users at any instance in time. The authors formulate the problem of the transmission power in different channels as a dynamic programming problem.

The next two papers in the special issue present ideas on cognitive radios and programmable mobile networks. Wireless multimedia applications require significant bandwidth, some of which is provided by third generation (3G) services. Even with substantial investment in 3G infrastructure, the radio spectrum allocated to 3G is limited. The next paper of the special issue by Mitola introduces the notion of cognitive radio for flexible mobile multimedia communications. Cognitive radio offers a mechanism for the flexible pooling of radio spectrum using a new class of protocols called formal radio etiquettes. This approach could expand the bandwidth available for conventional uses (e.g., police, fire and rescue) and extend the spatial coverage of 3G in a novel way.

Customizing handoff control and mobility management calls for advances in software and networking technologies in order to respond to specific radio, mobility and service quality requirements of future wireless service providers. In the next paper, Kounavis, Campbell, Ito and Bianchi, present the design, implementation and evaluation of a programmable handoff architecture capable of profiling, creating and deploying new handoff services on-demand. Two new services are discussed: (i) a multi-handoff access service, which is capable of simultaneously supporting multiple styles of handoff control over

the same physical infrastructure, and (ii) a reflective handoff service, which allows mobile devices to freely roam between heterogeneous wireless access networks with differing signaling systems.

The final two papers of the special issue deal with performance analysis of CDMA mobile communications and increased capacity reuse in an enhanced GSM radio network. The problem of deriving the multidimensional distribution of a segment of long-range dependent traffic in third generation mobile communication networks is considered in a paper by Tsybakov. An exact expression for the probability is found when a self-similar process models the traffic. The probability of heavy traffic period, the outage probability and the level-crossing probability are presented.

In cellular networks it is difficult to provision resources for increased demand in the required cells as needed. Frequency planning for hierarchically cellular networks represents a complex task. In the final paper of this special issue, Deissner and Fettweis, study the ability of hierarchical cellular networks with inter-layer reuse to increase the capacity of GSM networks. The authors apply total frequency hopping and adaptive frequency allocation as a strategy for the reuse of macro- and micro-cellular resources without frequency planning for indoor picocells.

For more information on IEEE MOMUC'99 see <http://cwc.ucsd.edu/infocenter/momuc99/>

We hope you enjoy this special issue.

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