

SALAM AKOUM

Wireless Networking and Communication Group
ECE department, University of Texas at Austin
Email: salam.akoum@mail.utexas.edu
Web: <http://users.ece.utexas.edu/~sakoum/>

RESEARCH INTERESTS

MIMO wireless communication, cognitive radios, digital signal processing techniques for software radios.

EDUCATION

- **The University of Texas at Austin**
PhD in Electrical and Computer Engineering (September 2008 – present)
Wireless Networking and Communication Group
Advisor: Prof. Robert W. Heath Jr.
- **University of Utah**
Master of Science in Electrical Engineering (July 2008)
GPA: 4.00/4.00
Advisor: Prof. Behrouz Farhang-Boroujeny.
- **American University of Beirut**
BE in Computer and Communication Engineering (CCE) (Honors)
Minor degree in Mathematics (GPA: 89/100)

EXPERIENCE

ALCATEL-LUCENT CHAIRE ON FLEXIBLE RADIOS (SUPELEC - FRANCE)

- **Cooperative frequency reuse for the downlink of cellular systems**
Research project – supervisor: Prof. Merouane Debbah **June 2009 – August 2009**
We develop and analyze a space time coded cooperative diversity protocol for the downlink of a cellular system. The protocol exploits frequency reuse to create spatial diversity among adjacent base stations. The results can be straightforwardly applied to existing cellular systems such as GSM or WiMAX.

UNIVERSITY OF TEXAS AT AUSTIN

- **Limited feedback beamforming for temporally correlated MIMO channels with multi-cell interference**
Research project – supervisor: Prof. Robert W. Heath Jr. **Sept 2008 – May 2009**
We consider the effect of the delay on the feedback channel on the achievable sum rate of the system. We define a notion of rate mismatch between the transmitter and the receiver due to delay and we derive expressions for the goodput gain in terms of the quantized CSI Markov properties.

UNIVERSITY OF UTAH

- **Soft MIMO detection using constrained Markov chain Monte Carlo methods**
Master thesis research – supervisor : Prof. B. Farhang-Boroujeny **Jan 2007 – Jul 2008**
We consider statistical methods that are based on Markov chain Monte Carlo (MCMC) methods for detection in

both MIMO and CDMA systems. We show that these methods exhibit a serious problem at medium to high SNR referred to as the “stalling” problem. We propose new constrained, low complexity MCMC search strategies for that exhibit excellent performance and low complexity for MIMO spatial multiplexing detection.

- **Implementation of a cognitive radio modem for first responders in a disaster scenario.**
Smart Radio Challenge '07 – SDR Forum Jan 2007 – Dec 2007
We design and implement (in a group of 5) a cognitive radio system for dynamic spectrum access to be used by first responders in disaster scenarios. We use the filterbanks method for spectrum sensing and we show, through real time experiments, that this method has superior performance in terms of the spectral dynamic range when compared to the conventional Fast Fourier Transform (FFT) techniques, i.e. periodogram method. Our team won the **best paper award** in the SDR technical conference, Denver, Colorado '07. It has been named finalist along with 7 other teams among 42 participating teams worldwide.
- **Hardware implementation of a multi-user/MIMO detector based on the MCMC method.**
Summer internship – supervisor: Prof. B. Farhang-Boroujeny Jul 2005 – Sept 2005
The project consisted of extending the design and FPGA implementation of a MIMO detection algorithm based on Markov Chain Monte Carlo (MCMC) method to 16-QAM signaling. This project was carried out for the non-pipelined and the pipelined versions of the algorithm while studying the issues related to the timing of the various designs.
- **Teaching assistant – Implementation of DSP systems**
Supervisor: B. Stenquist, Prof. B. Farhang-Boroujeny Jan 2008 – May 2008
Administered Laboratory sessions. Graded home works and laboratory reports.
- **Teaching assistant - Applied Signal Technology (AST, inc) clinic.**
Supervisor: Prof. B. Farhang-Boroujeny Jan 2007 – May 2007
Designed and guided students to implement an extended lock range PLL for use in software defined radios. The PLL uses previous phase difference information to detect wrapping when it occurs and reverse its effect. The project included an FPGA implementation of a non-data aided carrier acquisition system based on the extended PLL for QAM and PSK signals.
- **Graduate Assistant - ECE department**
NSF Integrated System Level Design Curriculum Jun 2007 – Dec 2007
Developed laboratory projects in C for the real time DSP implementation and DSP courses.
Administered laboratory sessions for the real time DSP implementation course.
Designed Labview interfaces for the electric circuits and electronics laboratories.

AMERICAN UNIVERSITY OF BEIRUT

- **New methodologies in Brain Computer Interface (BCI)**
Final Year Project – supervisor: Prof. F. Karamneh Sept 2005 – May 2006
We investigated brain activity in the alpha band (8-12 Hz) in the pre-motor cortex. We studied the correlations between motor imagery (movement planning) and both power and phase of the alpha waves.
- **Implementation of a basic file system in C under Linux (Spring 2006)**
- **Implementation of a simple shell in C (Spring 2006)**
- **Implementation of a single cycle, a multi-cycle and a pipelined datapath for a subset of MIPS instructions set in VHDL (Fall 2004-2005)**

HONORS

- 2007 Smart Radio Challenge best paper award, SDR Technical Conference. Denver, CO, Nov. 2007
- 2007 Smart Radio Challenge Finalist (Top 8 teams)
- Dean's Honor List, American University of Beirut (Fall 2002-Spring 2006)
- National Center for Scientific Research (CNRS) educational scholarship award \$7000 annual scholarship, Beirut, Lebanon, September 2002.
- Hariri Foundation achievement award, in recognition of outstanding academic achievement Beirut, Lebanon, October 2002.
- Ministry of Education scholarship award, \$2000 scholarship, Beirut, Lebanon, October 2002

TECHNICAL SKILLS

MATLAB, Simulink , C/C++, VHDL, LabVIEW, Code Composer Studio, XILINX ISE, Visual C++.

PUBLICATIONS

- **S. Akoum**, M. Zwingelstein-Colin, R.W. Heath Jr., M. Debbah, "Cooperative Frequency reuse for the downlink of cellular systems", submitted to IEEE International Conference on Communications, ICC 2010.
- **S. Akoum**, R. W. Heath Jr., "Limited feedback beamforming for temporally correlated channels with other cell interference", submitted to IEEE International on Acoustics, Speech and Signal Processing, ICASSP 2010.
- **S. Akoum**, R. Peng, R. Chen, B. Farhang-Boroujeny, "Markov chain Monte Carlo methods for high SNR regimes", accepted to the proceedings of IEEE International Conference on Communication, ICC. June 2009.
- P. Amini, E. Azarnasab, P. Amini, **S. Akoum**, B. Farhang-Boroujeny, "An Experimental Cognitive Radio for First Responders", 2008 IEEE Dynamic Spectrum Access Conference (DySpan), October 2008.
- P. Amini, E. Azarnasab, **S. Akoum**, X. Mao, H. Rao, B. Farhang-Bouroujeny. "Implementation of a cognitive radio modem", 2007 Software Defined Radio Technical Conference, November 5-9, 2007. Denver, Colorado.
- **S. Akoum**, B. Farhang-Bouroujeny, "A phase locked loop with arbitrarily wide lock range for software defined radios, 2007 Software Defined Radio Technical Conference, November 5-9, 2007. Denver, Colorado.

Patents

- B. Farhang-Boroujeny, **S. Akoum**, " Estimation of Log-likelihood values using constrained Markov Chain Monte Carlo simulations;. United States Provisional Patent Application, June 2008.

PROFESSIONAL MEMBERSHIPS

IEEE, GOLDEN KEY HONOUR SOCIETY, STUDENT MEMBER