

## Karim G. Seddik

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### Education

- ◇ **University of Maryland**, College Park, MD.  
Ph.D. Candidate in Electrical and Computer Engineering, September 2004-present. (GPA = 4.0/4.0)  
Research topic “A General Framework for Diversity Achieving Schemes over Cooperative Networks”.  
Advisor: Prof. K. J. Ray Liu.  
Expected Graduation Date: May 2008.
- ◇ **University of Maryland**, College Park, MD.  
M.Sc. in Electrical Engineering, Fall 2007. (GPA= 4.0/4.0)
- ◇ **Alexandria University**, Egypt.  
M.Sc. in Electrical Engineering, April 2004. (GPA= 4.0/4.0)  
Thesis title: “Blind Channel Estimation in OFDM systems”.
- ◇ **Alexandria University**, Egypt.  
B.Sc. in Electrical and Electronics Engineering, June 2001.  
Cumulative Grade “Distinction With Degree of Honor (94.27%)”.  
Department Rank: First on a class of 267 students.  
Graduation Project: “Personal Communications”.

### Honors

- ◇ Future Faculty Program (FFP) Fellowship, University of Maryland 2006-2008.
- ◇ University of Maryland Graduate School Super Fellowship, 2004-2006.
- ◇ Distinction at M.Sc, Alexandria University 2004.
- ◇ Certificate of Honor from the Egyptian President Mohammed Hosni Mubark in 2002 for being ranked first among all departments in College of Engineering, Alexandria University.
- ◇ Distinction with Honor degree at B.Sc and ranked First on a class of 267 students, Alexandria University 2001.
- ◇ Certificate of Merit, First Class Honors, for being one of the top ten students in the electrical engineering department during my undergraduate study, Alexandria University, Egypt 1997-2001.

### Skills & Background

- ◇ **Programming Languages:** Matlab and C.
- ◇ **Course related experience:** probability and random processes, signal processing, error control coding, information theory, convex optimization, and communication theory.
- ◇ **Research related experience:** pilot-based and blind channel estimation in OFDM and MIMO-OFDM systems, design of Space-Time and Space-Frequency codes, design of communication protocols for cooperative networks, design of distributed Space-Time and Space-Frequency codes in cooperative networks, source and channel diversity over cooperative networks, and distributed detection in sensor networks.
- ◇ **Wireless Standards:** IS-95, GSM, 802.11, and WCDMA.

## Research Interests

- ◇ Blind Channel Estimation in OFDM and MIMO-OFDM Systems
  - Subspace decomposition based algorithms.
  - Finite alphabet based algorithms.
- ◇ Cooperative Communications
  - Optimal power allocation among relay nodes.
  - Design of distributed space-time codes (DSTC).
  - Design of distributed space-frequency codes (DSFC).
- ◇ Source and Channel Encoders over Relay Channels
  - Distortion exponent for source and channel diversities achieving schemes.
  - Selecting the optimum number of relays for cooperation.
  - Optimal rate allocation between source and channel encoders.
- ◇ Sensor Networks
  - Distributed detection in wireless sensor networks.

## Publications

- ◇ Journal Papers
  1. **K. G. Seddik**, A. K. Sadek, W. Su, and K. J. R. Liu, "Outage Analysis and Optimal Power Allocation for Multi-Node Relay Networks," *IEEE Signal Processing Letters*, vol. 14, no. 6, pp. 377–380, June 2007.
  2. **K. G. Seddik**, A. K. Sadek, A. S. Ibrahim, and K. J. R. Liu, "Design Criteria and Performance Analysis for Distributed Space-Time Coding," to appear in *IEEE Transactions on Vehicular Technology*, May 2008.
  3. **K. G. Seddik**, A. S. Ibrahim, and K. J. R. Liu, "Trans-Modulation in Wireless Relay Networks," accepted for publication in *IEEE Communications Letters*.
  4. **K. G. Seddik** and K. J. R. Liu, "Distributed Space-Frequency Coding over Broadband Relay Channels," accepted for publication in *IEEE Transactions on Wireless Communications*.
  5. **K. G. Seddik**, A. Kwasinski, and K. J. R. Liu, "Source-Channel Diversity over Relay Channels," submitted to *IEEE Transactions on Wireless Communications*.
  6. A. S. Ibrahim, **K. G. Seddik**, and K. J. R. Liu, "Connectivity-Aware Network Maintenance and Repair via Relays Deployment," submitted to *IEEE Transactions on Wireless Communications*.
  7. **K. G. Seddik** and K. J. R. Liu, "Distributed Detection in Wireless Sensor Networks: a Sensor or a Relay?," in preparation.
- ◇ Conference Papers
  1. I. Ghaleb, O. A. Alim, and **K. G. Seddik**, "A new finite alphabet based blind channel estimation for OFDM systems", *IEEE Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, pp.102–105, Lisbon, Portugal, July 2004.
  2. **K. G. Seddik**, A. K. Sadek, W. Su, and K. J. R. Liu, "Outage Analysis of Multi-Node Amplify-and-Forward Relay Networks", *IEEE Wireless Communications and Networking Conference (WCNC)*, Las Vegas, NV, April 2006.
  3. **K. G. Seddik**, A. K. Sadek, and K. J. R. Liu, "Protocol-Aware Design Criteria and Performance Analysis for Distributed Space-Time Coding", *IEEE Global Telecommunications Conference (GLOBECOM)*, San Francisco, CA, Nov. 2006.

4. **K. G. Seddik**, A. Kwasinski, and K. J. R. Liu, "Distortion Exponents for Different Source-Channel Diversity Achieving Schemes over Multi-Hop Channels," *IEEE International Conference on Communications (ICC)*, Glasgow, Scotland, June 2007.
5. **K. G. Seddik**, A. K. Sadek, A. S. Ibrahim, and K. J. R. Liu, "Synchronization-Aware Distributed Space-Time Codes in Wireless Relay Networks," *IEEE Global Telecommunications Conference (GLOBECOM)*, Washington D.C., Nov. 2007.
6. **K. G. Seddik** and K. J. R. Liu, "Distributed Space-Frequency Coding over Relay Channels," *IEEE Global Telecommunications Conference (GLOBECOM)*, Washington D.C., Nov. 2007.
7. A. S. Ibrahim, **K. G. Seddik**, and K. J. R. Liu, "Improving Connectivity via Relays Deployment in Wireless Sensor Networks," *IEEE Global Telecommunications Conference (GLOBECOM)*, Washington D.C., Nov. 2007.
8. **K. G. Seddik**, A. Kwasinski, and K. J. R. Liu, "Asymptotic Distortion Performance of Source-Channel Diversity Schemes over Relay Channels," to appear in *IEEE Wireless Communication and Networking Conference (WCNC)*, Las Vegas, NV, April 2008.
9. **K. G. Seddik** and K. J. R. Liu, "Distributed Space-Frequency Coding over Amplify-and-Forward Relay Channels," to appear in *IEEE Wireless Communication and Networking Conference (WCNC)*, Las Vegas, NV, April 2008.
10. A. S. Ibrahim, **K. G. Seddik**, and K. J. R. Liu, "Connectivity-Aware Network Maintenance and Repair via Relays Deployment," to appear in *IEEE Wireless Communication and Networking Conference (WCNC)*, Las Vegas, NV, April 2008.

#### Graduate Courses

- ◇ Random Processes in Communication and Control (Grade A).
- ◇ Advanced Digital Signal Processing (Grade A+).
- ◇ System Theory (Grade A).
- ◇ Information Theory (Grade A).
- ◇ Estimation and Detection Theory (Grade A+).
- ◇ Space-Time Signal Processing (Grade A+).
- ◇ Multiuser Information Theory (Grade A).
- ◇ Error Correcting Codes (Grade A).
- ◇ Optimal Control (Grade A+).
- ◇ Numerical Analysis I (Grade A).
- ◇ Advanced Numerical Optimization (Grade A).

#### Professional Activities

- ◇ Student Member, IEEE.
- ◇ Reviewer for IEEE Journals
  - IEEE Transactions on Signal Processing
  - IEEE Transactions on Communications
  - IEEE Journal on Selected Areas in Communications (JSAC)
  - IEEE Transactions on Wireless Communications
  - IEEE Transactions on Image Processing
  - IEEE Transactions on Vehicular Technology
  - IEEE Communications Letters
- ◇ Reviewer for European Transactions on Telecommunications

- ◇ Technical Program Committee (TPC)
  - International Wireless Communications and Mobile Computing Conference (IWCMC), 2007
- ◇ Reviewer for Conferences
  - IEEE Global Telecommunications Conference (Globecom)
  - IEEE International Conference on Communications (ICC)
  - IEEE Wireless Communications and Networking Conference (WCNC)
  - IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)
  - International Symposium on Wireless Local and Personal Area Networks (IWCMC)

## Work Experience

- ◇ **Research Assistant**, (Sept. 04 - Dec. 06, June 07 - present)  
Department of Electrical and Computer Engineering, University of Maryland at College Park. Research topic: Unified Diversity Framework for Cooperative Communications.
- ◇ **Graduate Teaching Fellow**, (Jan. 07 - May 07)  
Department of Electrical and Computer Engineering, University of Maryland at College Park. Assisted in teaching the Space-Time Signal Processing graduate course.
- ◇ **Teaching Assistant**, (Sept. 01 - July 04 ) Alexandria University, Egypt.  
Assisted in teaching: Microprocessor Architecture, Electronic Circuits, Optical Networks Design, Logic Design, Introduction to Computers, Advanced Communication Systems.

## Projects

- ◇ **Maryland Industrial Partnerships (MIPS) project: Baseband Algorithm Design for MIMO-OFDM (Phase I)**  
We develop a baseband algorithm design for MIMO-OFDM following the IEEE 802.11n standard with an objective to deliver a maximum data rate of 315 Mbps. The configuration is based on  $2 \times 2$  operation which has two transmit chains, two receive chains, and two spatial streams multiplexed across the radio link. A 40 MHz channel bandwidth in the 5 GHz band is used. I was responsible of developing the baseband algorithm design and implementation of a V-BLAST transceiver using Matlab.
- ◇ **Maryland Industrial Partnerships (MIPS) project: Baseband Algorithm Design for MIMO-OFDM (Phase II)**  
In this phase of the project we extend the work done in Phase I of the project by employing Space-Time Coding, Space-Frequency Coding, and Transmit Beamforming at the transmitter side. I am responsible of developing the baseband algorithm design and implementation of the transceiver using Matlab.
- ◇ **Graduate Courses Projects**
  - **Filterbank Design and Subband Coding For Digital Images** (Course Grade A+)  
In this project, the structure of filter banks for nearly perfect reconstruction was considered. The performance of the subband coding of still images as compared to that of the transform based techniques was investigated.
  - **Symbol Error Rate (SER) and Optimal Power Allocation for Multi-node Amplify-and-Forward Protocol** (Course Grade A+)  
In this project, the SER performance of the multi-node amplify-and-forward protocol was considered. An asymptotic tight bound for the SER was derived. Based on the derived bound, optimal power allocation was carried out among the relay nodes.

– **Semi-definite Relaxation for Detection of 16-QAM Signaling in MIMO Channels**  
(Course Grade A)

In this project, the design of a receiver detector for a MIMO system employing 16-QAM signals was considered. Convex relaxation of the Maximum Likelihood (ML) detector was shown to result in a semi-definite program that can be efficiently solved using standard convex optimization packages.

## References

- **Prof. K. J. Ray Liu, IEEE Fellow**  
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