Neal Patwari

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EDUCATION

University of Michigan, Ann Arbor, Ph.D. in Electrical Engineering — Sept. 2005
Dissertation: "Location Estimation in Sensor Networks"
Advisor: Alfred O. Hero III

Virginia Tech, M.S. in Electrical Engineering. Thesis: "Measured & Modeled Time & Angle Dispersion Characteristics of the 1.8 GHz Peer-to-Peer Radio Channel" — May 1999
Advisor: Theodore S. Rappaport

Virginia Tech, B.S. in Electrical Engineering, *summa cum laude* — May 1997

PROFESSIONAL EXPERIENCE

University of Michigan, Laboratory of Prof. Alfred O. Hero III — Sept. 2005 to present
Postdoctoral Research Fellow
Joint source and sensor location & tracking in sensor networks

University of Michigan, Laboratory of Prof. Alfred O. Hero III — Sept. 2001 to Sept. 2005
Graduate Research Assistant
Estimation, detection, dimension reduction in wireless and wired sensor networks

Motorola Labs, Florida Communications Research Lab — June 1999 to Aug. 2001
Research Engineer
Systems research in localization & wireless sensor networks

Virginia Tech, Mobile & Portable Radio Research Group — Jan. 1996 to May 1999
Graduate Research Assistant
Wideband, space-time radio channel measurements and modeling

TEACHING EXPERIENCE

University of Michigan, Dept. of EECS, *Graduate Student Instructor*:

Discrete Mathematics (EECS 203) with Dr. Bill Rounds & Dr. Martha Pollack — Fall 2003
Conducted weekly hour-long discussion sections for 85 students

Probability and Random Processes (EECS 501) with Dr. Serap Savari — Fall 2004
Conducted weekly 2-hour discussion sections for 75 1^{st} year graduate students

TEMPORARY POSITIONS

- **Army Research Lab** w/ Brian M. Sadler, Adelphi, MD — Summer 2002
- **Oak Ridge National Lab** Engr. Science & Technology Div., Oak Ridge, TN — Summer 1997

HONORS AND AWARDS

- *Michigan Teaching Fellow*, U.M. Center for Research on Learning and Teaching — June 2005
- *Top 20% of Grad. Student Instructors*, U.M. College of Engineering — Dec. 2004
- *Outstanding Mentor Award*, Siemens Westinghouse Science Competition — Oct. 2004
- *Best Student Paper Award Finalist*, IEEE ICASSP'04 — May 2004
- *Best Graduate Student Instructor Award Nominee*, U.M. Dept. of EECS — Dec. 2003
- *National Science Foundation Graduate Research Fellow* — 1997-2002
- *Best Paper Award*, Motorola Systems Symposium — May 2000
- *Bradley Scholar* (Four-year full scholarship), Virginia Tech Dept. of EE — 1993-1997

ISSUED PATENTS

U.S. #6,865,347	"Optically-based location system and method for determining a location at a structure"	March 8, 2005
U.S. #6,853,445	"Two-dimensional angle of arrival detection device"	Feb. 8, 2005
U.S. #6,748,324	"Method for determining location information"	June 8, 2004
U.S. #6,745,038	"Intra-piconet location determination and tomography"	June 1, 2004
U.S. #6,473,038	"Method and apparatus for location estimation"	Oct. 29, 2002

ACADEMIC SERVICE

- Served as a reviewer for journals:

IEEE J. Sel. Areas Communication	IEEE Network
IEEE Trans. Aerospace Elect. Systems	ACM/IEEE Trans. Sensor Networks
IEEE Trans. Antennas & Propagation	IEEE Trans. Signal Processing
IEEE Trans. Communications	IEEE Trans. Vehicular Technology
IEEE Trans. Computers	IEEE Trans. Wireless Communications
IEEE Trans. Mobile Computing	(Old City) Ad Hoc & Sensor Wireless Networks

- Technical Committee Member, Bluetooth^{TM} Local Positioning Working Group

ACADEMIC ADVISING

- NSF REU: Adam Pacholski, Jionglin Wu (U.M. EECS) — Sept. 2004 to Aug. 2005
- NASA SHARP/SAP (high school): Panna Felsen, Abiola Omishope — Summer 2004, 2005

INVITED PRESENTATIONS

- "Adaptive Neighbor Weighting for Robust & Accurate Sensor Localization", Presentation at the *ARO-Sponsored Workshop on Localization in Wireless Sensor Networks: Estimation, Security & Robustness*, Seattle, WA, June 13, 2005.
- "Watching Traffic for an Anomaly: Data Visualization using Dimensionality Reduction", Presentation at the *Workshop on Internet Signal Processing (WISP)*, CAIDA, San Diego, CA, Nov. 11, 2004.
- "How well can a wireless network locate a sensor?" Invited Talk at the U. of Washington-Seattle, Aug. 31, 2004.

- "Learning Location: and, Sensor Data *is* Location", Invited Talk at Motorola Labs, Plantation FL, Feb. 23, 2004.
- "Locating with Less: Self-Calibration Estimation in Wireless Sensor Networks", Invited Talk at the Ohio State U. Information Processing Systems Lab, May 27, 2003.
- "Self-Calibration and Energy-Efficient Detection in Wireless Sensor Networks", Invited Talk at Motorola Labs, Plantation FL, Feb. 14, 2003.

JOURNAL PUBLICATIONS IN REVIEW

[R1] J. A. Costa, N. Patwari, and A. O. Hero III, "Distributed multidimensional scaling with adaptive weighting for node localization in sensor networks," *ACM/IEEE Trans. Sensor Networks*, (to appear) Submitted June, 2004. Available: `http://www.eecs.umich.edu/~hero/comm.html`

JOURNAL PUBLICATIONS

[J4] N. Patwari, J. Ash, S. Kyperountas, R. M. Moses, A. O. Hero III, and N. S. Correal, "Locating the nodes: Cooperative localization in wireless sensor networks," *IEEE Signal Processing*, vol. 22, no. 4, pp. 54–69, July 2005.

[J3] N. Patwari, A. O. Hero III, M. Perkins, N. Correal, and R. J. O'Dea, "Relative location estimation in wireless sensor networks," *IEEE Trans. Sig. Proc.*, vol. 51, no. 8, pp. 2137–2148, Aug. 2003.

[J2] N. Patwari and A. Safaai-Jazi, "High-gain low-sidelobe double-vee dipoles," *IEEE Trans. Antennas & Propagation*, vol. 48, no. 2, pp. 333–335, Feb. 2000.

[J1] G. D. Durgin, N. Patwari, and T. S. Rappaport, "Improved 3D ray launching method for wireless propagation prediction," *IEE Electronics Letters*, vol. 33, no. 16, pp. 1412–1413, 31 July 1997.

CONFERENCE PUBLICATIONS

[C15] N. Patwari, A. O. Hero III, and A. Pacholski, "Manifold learning visualization of network traffic data," in *ACM SIGCOMM Workshop on Mining Network Data (MineNet'05)*, Aug. 2005, pp. 191–196.

[C14] N. Patwari and A. O. Hero III, "Adaptive neighborhoods for manifold learning-based sensor localization," in *IEEE Workshop on Signal Processing Adv. Wireless Commun. (SPAWC'05)*, June 2005, pp. 1098–1102. (Invited paper)

[C13] J. A. Costa, N. Patwari, and A. O. Hero III, "Achieving high-accuracy distributed localization in sensor networks," in *IEEE Int. Conf. on Acoustic, Speech, & Signal Processing (ICASSP'05)*, vol. 3, March 2005, pp. 641–644. (Best student paper award finalist)

[C12] N. Patwari and A. O. Hero III, "Manifold learning algorithms for localization in wireless sensor networks," in *IEEE Intl. Conf. on Acoustic, Speech, & Signal Processing (ICASSP'04)*, vol. 3, May 2004, pp. 857–860.

[C11] N. Patwari, A. O. Hero III, and B. M. Sadler, "Hierarchical censoring sensors for change detection," in *IEEE Workshop on Statistical Signal Processing (SSP'03)*, Sept 2003, pp. 21–24.

[C10] N. Patwari and A. O. Hero III, "Using proximity and quantized RSS for sensor localization in wireless networks," in *2nd ACM Workshop on Wireless Sensor Networks & Applications (WSNA'03)*, Sept. 2003, pp. 20–29.

[C9] ——, "Hierarchical censoring for distributed detection in wireless sensor networks," in *IEEE Int. Conf. on Acoustic, Speech & Signal Processing (ICASSP'03)*, vol. 4, April 2003, pp. 848–851.

[C8] ——, "Location estimation accuracy in wireless sensor networks," in *Asilomar Conf. on Signals, Systems, & Computers*, vol. 2, Nov. 2002, pp. 1523–1527.

[C7] N. Patwari, Y. Wang, and R. J. O'Dea, "The importance of the multipoint-to-multipoint indoor radio channel in ad hoc networks," in *IEEE Wireless Commun. and Networking Conf. (WCNC)*, March 2002, pp. 608–612.

[C6] N. S. Correal and N. Patwari, "Wireless sensor networks: Challenges and opportunities," in *Proceedings of the 2001 Virginia Tech Symposium on Wireless Personal Communications*, June 2001, pp. 1–9.

[C5] Q. Shi, R. J. O'Dea, M. Perkins, and N. Patwari, "A new code-timing estimation algorithm for DS-CDMA," in *IEEE Vehicular Technology Conf. (VTC'01)*, vol. 2, Oct. 2001, pp. 1187–1190.

[C4] N. Patwari, R. J. O'Dea, and Y. Wang, "Relative location in wireless networks," in *IEEE Vehicular Technology Conf. (VTC)*, vol. 2, May 2001, pp. 1149–1153.

[C3] N. Patwari, G. D. Durgin, T. S. Rappaport, and R. J. Boyle, "Peer-to-peer low antenna outdoor radio wave propagation at 1.8 GHz," in *IEEE Vehicular Technology Conf. (VTC'99)*, vol. 1, May 1999, pp. 371–375.

[C2] N. Patwari and A. Safaai-Jazi, "Predictions and measurements of double-vee dipoles," in *IEEE Antennas and Propagation Int. Symposium*, vol. 3, June 1998, pp. 1426–1429.

[C1] G. D. Durgin, N. Patwari, and T. S. Rappaport, "An advanced 3D ray launching method for wireless propagation prediction," in *IEEE Vehicular Technology Conf. (VTC'97)*, vol. 2, May 1997, pp. 785–789.

PROFESSIONAL MEMBERSHIP

- Institute of Electronics and Electrical Engineers (IEEE) 1996-current
- Association of Computing Machinery (ACM) 2003-current

REFERENCES

Available upon request.