

Harpreet Singh Dhillon

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ACADEMIC QUALIFICATIONS

Virginia Tech (VT)

MS, Electrical Engineering (GPA: 4.0/4.0)

- Thesis: Cognitive MIMO Radio: Incorporating DSA in Multiuser MIMO Network.

Blacksburg, USA

2008 - 2010 (expected)

Indian Institute of Technology (IIT)

B.Tech, Electronics and Communication Engineering (GPA: 9.12/10)

- Thesis: An Adaptive Space Time Decoder with Quadrant-Localized Search Algorithm.

Guwahati, India

2004 - 2008

RESEARCH INTERESTS

- Fundamental Capacity Limits of Multiuser MIMO and Cognitive MIMO Networks
- Space Time Coding and Lattice Decoding for MIMO Systems
- Non-Invasive Sleep Apnea Monitoring Techniques

RESEARCH/WORK EXPERIENCE

Mobile and Portable Radio Research Group (MPRG), Virginia Tech

Graduate Research Assistant

Blacksburg, USA

July 2008 – May 2009 & Aug. 2009 – present

- Incorporated dynamic spectrum access (DSA) in multiuser MIMO setup to come up with a general mathematical framework to study the system capacity of a cognitive MIMO network.
- Developed a provably global optimization algorithm to maximize sum-rate of a cognitive MIMO network.
- Developing a cognitive radio network using USRPs and GNUradio to study the benefit of collaboration in dynamic spectrum sharing.

QUALCOMM Inc. (QCT Wireless Connectivity - Bluetooth)

Summer Intern

San Diego, CA, USA

May 2009 – Aug. 2009

- Performance test of bluetooth profiles, such as FTP and OPP, over various bluetooth stacks (including Android).
- Baseband throughput analysis: Understanding the effect of channel conditions on packet type selection.

Indian Institute of Technology (IIT)

Undergraduate Research

Guwahati, India

May 2006 – May 2007 & July 2007 – May 2008

- Proposed a new quadrant-localized decoding algorithm for space time codes.
- Developed and demonstrated a low-cost fully-functional sleep apnea monitor (targeted for developing nations).

CERCOM, Dipartimento di Elettronica, Politecnico di Torino

Research Intern

Torino, Italy

May 2007 – July 2007

- Implemented a soft output sphere decoder for the Golden space-time code in MATLAB and C++.
- Proposed a new method to estimate optimum starting value of the sphere radius based on noise variance.

PATENT FILED

- H. Singhal, H. S. Dhillon and H. B. Nemade, "Sleep Apnea Monitor to Detect All the Forms of Apnea", 2007.

AWARDS AND HONORS

- **Agilent Engineering and Technology Award 2008:** *Apnea Monitor* was adjudged to be the best research project of the country. As a result, I was invited to Agilent's R&D Labs at Santa Clara for brief demonstration of the product.
- **NASA Tech Briefs Create the Future Design Contest 2007:** *Low-Cost Sudden Infant Death Syndrome Monitor* was adjudged to be among the top 3 projects in the medical category worldwide.
- Featured in the **Graduate Students of Distinction at Virginia Tech** (2008-09).
- **International Exhibition for Young Inventors (IEYI '06):** *Infant Apnea Monitor* was selected among top 25 innovative projects of the country to represent India in this exhibition.
- **INTEL Science Fair:** Selected to participate in the prestigious fair, *Initiative for Research and Innovation in Science (IRIS) 2006*.
- *Apnea Monitor* was selected to be the part of **IIT Guwahati Portal** of industrial and innovative products (2007 – 2008).
- **Best Paper Award**, national level paper presentation contest, *IEEE Techscribe 2006*.
- **Best Design Project Award 2007** for the project titled *Wireless Remote Controller for the Home Appliances*.
- Second Best **Hardware Project Award**, national level open hardware contest, *Techniche 2006*, IIT Guwahati.

JOURNAL PUBLICATIONS

- **H. S. Dhillon** and R. M. Buehrer, “Optimal Sum Rate of a Multiuser MIMO Network”, being communicated to *IEEE Communication Letters*.
- **H. S. Dhillon**, H. Singhal and H. B. Nemade, “Respiration Movement Based Sleep Apnea Monitor”, *Electronics Letters*, vol. 44, no. 6, pp. 398–399, Mar. 2008.
- **H. S. Dhillon** and A. Mitra, “A Reduced-Bit Multiplication Algorithm for Digital Arithmetic”, *Int. J. Mathematics Sciences*, vol.2, no.2, pp. 64-69, 2008.
- A. Mitra and **H. S. Dhillon**, “Evaluating Sinusoidal Functions by a Low Complexity Cubic Spline Interpolator with Error Optimization”, *Int. Journal Comp. Sc.*, vol. 2, no. 2, pp. 110–117, 2007.
- **H. S. Dhillon** and A. Mitra, “A Low Power Architecture of Digital Sinusoidal Generator Using Cubic Spline Interpolation”, *IETE Journal of Education*, vol. 47, no. 3, pp. 129–136, July - Sept. 2006.
- **H. S. Dhillon**, K. Patil and A. Mitra, “An IR-linked Wireless Remote Controller with an Asynchronous Digital Transceiver”, *IEEE Trans. Consum. Electronics*. (Under Review)

REFEREED CONFERENCE PUBLICATIONS

- **H. S. Dhillon** and R. M. Buehrer, “Cognitive MIMO Radio: Incorporating Dynamic Spectrum Access in Multiuser MIMO Network”, selected for publication in Proc. *IEEE GLOBECOM 2009*, Nov. 30 - Dec. 5, 2009.
 - **H. S. Dhillon**, H. Aggarwal and A. Mitra, “A Simple Direction-Based Lattice Decoding Algorithm for Golden Code”, in Proc. *National Conf. Comm. (NCC 2009)*, Guwahati, India, Jan. 2009.
 - **H. S. Dhillon**, A. Tarable and S. Benedetto, “Soft Output Sphere Decoder for the Golden Code: Implementation and Complexity Analysis”, *Technical Report*, Politecnico di Torino, Italy, 2007.
 - **H. S. Dhillon** and A. Mitra, “A Digital Multiplier Architecture using Urdhva Tiryakbhyam Sutra of Vedic Mathematics”, in Proc. *IEEE Int. Conf. Comput., Comm., Control and Instru. (IEEE-IC3)*, Bangalore, Nov. 2007.
 - **H. S. Dhillon** and A. Mitra, “Architecture of a Low Power Digital Sinusoid Generator using a Two Interval Cubic Spline Interpolation Method with Error Optimization”, in Proc. *IEEE Int. Conf. Comput., Comm., Control and Instru. (IEEE-IC3)*, Bangalore, Nov. 2007.
 - K. Patil, **H. S. Dhillon** and A. Mitra, “A Telephone Based Wireless Remote Controller for Home Appliances”, in Proc. *National Conf. Comm. (NCC-2008)*, Bombay, Feb. 2008.
 - **H. S. Dhillon** and H. Singhal, “Novel Electronics Hardware for Continuous Time Respiration Signal Monitoring and Sleep Apnea Detection”, in Proc. *Int. Conf. on Advances in Electronics and Comm. Tech. (ICAECT)*, Punjab, Dec. 2006.
- Note: Please refer to <http://filebox.vt.edu/users/hdhillon/web/publications.html> for the electronic version of my publications.*

RELEVANT COURSES

Graduate Courses (Virginia Tech): Multi-channel Communications, Spread Spectrum Communications, Coding Theory, Digital Communications - Advanced Theory and Analysis, Stochastic Signals and Systems, Optimization.

Undergraduate Courses (IIT): Smart Antennas for Wireless Communications, Mobile Comm., Information Theory and Coding, Detection and Estimation Theory, Queuing Models for Performance Analysis, Digital Comm., Comm. Systems Engineering, Comm. Networks, Principles of Comm., Probability and Random Processes, Digital Signal Processing.

PROGRAMMING AND SOFTWARE SKILLS

- **Languages:** C, C++, VHDL, HTML, \LaTeX .
- **Matlab** including some of its toolboxes such as communications toolbox, filter design toolbox, signal processing toolbox, simulink and control systems toolbox.
- Conversant with cellular testing tools such as QXDM, QPST, ASIA Test Manager and TRACE32 JTAG Debugger.
- Conversant with various Microprocessor Programming languages and kits, specifically 8085, 8086 (8088).
- Radio frequency simulation softwares such as Ansoft HFSS, Ansoft Serenade.
- Circuit simulation softwares such as WinSPICE, SPICE; mask layout designing using MAGIC.

CO-CURRICULAR ACTIVITIES

- **Executive Member**, Breakthrough Science Society (BSS), IIT Guwahati Chapter (2006 – 08).
- Represented IIT Guwahati in Badminton in **41st Inter-IIT Sports Meet-2005** held in IIT Roorkee.
- **Best Player** award in Badminton in SGHPS Sports Meets in the years 2001 and 2003.
- **First prize** in CBSE Inter-School Athletics Meet 1997 – 98 in 100 meters event.
- **Head Boy** of SGHP School for the session 2003 – 04.

REFERENCES AVAILABLE UPON REQUEST