

VITA

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DISSERTATION TITLE

"Perfect Reconstruction Modulated Polyphase Filter Banks Using Reverse-Time Subfilters."

ACADEMIC TRAINING

- 1980-1985:** University of California at Davis, B.S. in Electrical and Computer Engineering.
- 1989-1990:** University of California at Santa Barbara, M.S. in Electrical and Computer Engineering.
- 1990-1993:** University of California at Santa Barbara, Ph.D. in Electrical and Computer Engineering.

PROFESSIONAL EXPERIENCE

2010-Present Holder of the Frank Carden Endowed Chair in Telemetry & Telecommunications and Full Professor. Current research interests include compressive sensing/sparse reconstruction for LIDAR and streaming sensor data as well as EEG brain analysis for audiovisual perceptual quality assessment and modeling.

October 2008 Selected for the International Foundation for Telemetry Endowed Professorship.

Jan. 2000-2008 Associate professor in the Klipsch School of Electrical & Computer Engineering. My teaching areas include digital signal processing, image processing, pattern classification, and source coding (signal compression). I have done past research in areas of image, video, and audio compression as well as feature vector extraction for pattern classification. Currently, my research interests include distributed compression, polarimetric image processing for scene analysis, and nonstationary signal denoising.

1993-1999: Researcher & Team Leader, Naval Air Warfare Center, China Lake. My research efforts have focused on high speed image and video compression technologies which offer unique capabilities such as robustness to transmission errors and regional localization. My team (2 other people) and I have implemented a real-time (3 to 15 frames/second with 240x512 frames) 320C80-based system which uses a wavelet transform along with embedded coding techniques to compress a video input and stream it through the Internet via TCP/IP protocols. Our recent research focus has been to add more intelligence to the encoder so that the space-frequency information in the image that is most useful for image analysis is received with the highest fidelity. While most of my recent research has been in the area of embedded compression, I am still very much interested in other applications of time/space-frequency

decompositions and of multirate digital signal processing concepts in general.

1999, Spring Quarter: Instructor at the University of California at Santa Barbara. Taught graduate class in Multirate Digital Signal Processing, ECE 258B.

1990-1993: Research Assistant, Department of Electrical and Computer Engineering, University of California, Santa Barbara. Worked under Prof. S.K. Mitra on subband coding and multirate filter bank theory. Also implemented real-time filter banks on a Motorola 56001 digital signal processor.

1992: Summer Employee, AT&T Bell labs, Murray Hill, NJ. Developed and simulated new methods of extremely low bit rate video coding for video telephone applications.

1985-1989: Design Engineer, Naval Weapons Center, China Lake. Designed, built, and tested the guidance electronics for the Laser Guided Training Round. This project included mixed analog and digital circuit design as well as the programming of an embedded DSP. Also developed software for an advanced video processor and studied ground target tracking.

FUNDED RESEARCH

- (2000) Office of Naval Research, *Compression of Digital Elevation Maps Using Non-linear Wavelets*, 2000-2003, \$94K
- (2001) Sandia National Labs, *Intelligent Compression for Remote Sensing*, 2001-2003, \$70K.
- (2002) National Science Foundation (Early Career Grant), *Efficient Audio Compression with Perceptually Embedded Scalability*, 2002-2007, \$350K.
- (2004) National Geospatial-Intelligence Agency, *Passive Polarimetric Imagery Classification Study*, 2004-2006, \$160K (joint with Dr. David Voelz).
- (2005) Los Alamos National Laboratories, *Signal Detection via Adapted Filter Banks and Geometric Dimensionality Reduction*, 2005-2006, \$15K (unburdened).
- (2006) Los Alamos National Laboratories, *Signal Detection via Adapted Filter Banks and Geometric Dimensionality Reduction*, 2006-2007, \$50K (unburdened).
- (2006) National Geospatial-Intelligence Agency, *Exploiting Polarization in Imaging Systems*, 2006-2009, \$304K (joint with Dr. David Voelz).
- (2006) Army Research Office, *Distributed Source Coding Using Bitstream-based Detection and Classification*, 2006-2009, \$326K.
- (2006) DARPA (Subcontract from LANL), *ADAM Project*, 2006-2007, \$104K (joint with Dr. Joe Lakey and Dr. Jaime Ramirez)
- (2009) NMSU IRG, *Perceptual audio quality evaluation by direct measurement of human brain responses*, 2009-2010, \$39K (joint with Dr. Jim Kroger, Psychology)
- (2011) National Science Foundation, *CIF:Medium:Assessment and modeling of temporal variation in perceived audio and video quality using direct brainwave measurement*, 2011-2015, \$917K (lead PI with Dr. Jim Kroger and Dr. Joerg Kliwer as co-PIs)
- (2011) NASA EPSCOR, *Proximity Operations for Near Earth Asteroid Exploration*, 2011-2014, \$750K (co-PI, with Dr. Eric Butcher (lead), others)
- (2012) National Geospatial Intelligence Agency (NGA), *Pulse Complexity Based LIDAR Scene Modeling for Sparse Reconstruction and Super-Resolution*, 2012-2013 (plus 3 1 year

options), \$150K (\$75K/option year), co-PI Dr. David Voelz.

OTHER DISTINCTIONS

- Awarded the International Foundation for Telemetry Professorship, October 2008.
- Received an educational fellowship from the Department of Defense, 1989-1992.
- Certificate of Merit for the outstanding technical paper awarded at the AIAA Missile Sciences Conference for the paper "Automatic target recognition directed image compression," Nov. 1998.
- Patent (classified) titled, "Microcontroller-Based Laser Pulse Decoder," awarded 1991.
- Patent titled "Parallel digital image compression system which exploits zerotree redundancies in wavelet coefficients," Patent Number 6,148,111.
- Patent titled "Efficient embedded image and video compression using lifted wavelets," Number: 6,466,698, granted October 15, 2002.
- Associate editor for IEEE Trans. on Image Processing, 2002-2005, 2010-2014
- Associate editor for IEEE Trans. on Multimedia, 2008-2013.
- Guest Editor, "Issue on Advances in Hyperspectral Data Processing and Analysis", IEEE Journal of Selected Topics in Signal Processing, Vol. 5, Numbers: 5 & 6, August-September 2015,
- Co-general chair, IEEE Digital Signal Processing Workshop, August 2004, Taos, NM.
- Co-technical chair for the 2012 and 2014 Southwest Symposium on Image Analysis and Interpretation.
- Student Paper Contest Chair, 40th Asilomar Conf. on Signals, Systems, and Computers, October 2006.
- Organized special session entitled "Applications of Multirate DSP" at the 40th Asilomar Conf. on Signals, Systems, and Computers, October 2006.
- Member of technical program committees for the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), the IEEE International Conference on Image Processing (ICIP), and the IEEE Data Compression Conference (DCC).
- Senior Area Editor, IEEE Transactions on Image Processing, March 2016 to present.

CONSULTING ACTIVITIES

- Video compression systems (technology consultant), Abba Tech, Albuquerque, NM, 2000.
- Expert witness in laser range-finding technology, Asia Optical Inc. (through NY law firm of Osterlenk, Faber, Gerb & Soffen), Case: LTI versus Nikon/AOI, July 2001-2003. Case went to trial/ testified in court.
- Technical expert for defense; Case: Real-Time v. AT&T (byte.mobile), 2011-2012, case settled June 2012.
- Technical expert for defense; Case: Princeton Digital v. Dell, 2014-2015, case dismissed June 2015.
- Technical expert for defense; Noninfringement & IPR (6,597,812), Real-time v. SAP, 1/2016-6/2016.

- Technical expert for defense; IPRs (7,378,992 & 7,415,530), Real-time v. Riverbed, 2/2016-present.
- Technical expert for defense; IPRs (8,643,513, 7,378,992, 7,161,506, & 9,054,728), Real-time v. Dell, 2/2016-present.
- Technical expert for defense; Noninfringement, Real-time v. HP Enterprises, 4/2016-present.
- Technical expert for defense; IPR (7,358,867, 7,161,506, & 9,054,728), Real-time v. Teradata 11/2016-present.
- Technical expert for defense; IPRs (8,643,513 & 7,378,992), Real-time v. Veritas 12/2016-present.

JOURNAL PUBLICATIONS

1. **C.D. Creusere and S.K. Mitra**, "A simple method for designing high-quality prototype filters for M-band pseudo-QMF banks," *IEEE Trans. on Signal Processing*, Vol. 43, No. 4, April 1995, pp. 1005-1007.
2. **C.D. Creusere and S.K. Mitra**, "Efficient audio coding using perfect reconstruction noncausal IIR filter banks," *IEEE Trans. on Speech and Audio Processing*, Vol. 4, No. 2, March 1996, pp. 115-123.
3. **C.D. Creusere and S.K. Mitra**, "Image coding using wavelets based on perfect reconstruction IIR filter banks," *IEEE Trans. on Circuits and Systems for Video Technology*, Vol. 6, No. 5, Oct. 1996, pp. 447-458.
4. **C.D. Creusere**, "A new method of robust image compression based on the embedded zerotree wavelet algorithm," *IEEE Trans. on Image Processing*, Vol 6, No. 10, Oct. 1997, pp. 1436-1442.
5. **C.D. Creusere and A. Van Nevel**, "ATR-directed image and video compression," *Journal of Aircraft*, Vol. 36, No. 4, pp. 626-31, July-August 1999.
6. **C.D. Creusere**, "Fast embedded compression for video," *IEEE Trans. on Image Processing*, Vol. 8, No. 12, pp. 1811-16, December 1999.
7. **C.D. Creusere**, "Motion compensated video compression with reduced complexity encoding for remote transmission," *Signal Processing: Image Communications*, Vol. 16, pp. 627-42, April 2000.
8. **C.D. Creusere**, "Understanding perceptual distortion in MPEG scalable audio coding," *IEEE Trans. on Speech and Audio Processing*, Vol. 13, No. 3, pp. 422-431, May 2005.
9. **L. E. Boucheron and C.D. Creusere**, "Lossless wavelet-based compression of digital elevation maps for fast and efficient search and retrieval," *IEEE Trans. on Geoscience and Remote Sensing*, Vol. 43, No. 5, pp. 1210-1214, May 2005.
10. **V. Thilak, D. Voelz, and C.D. Creusere**, "Polarization-based index of refraction and reflection angle estimation for remote sensing applications," *Applied Optics*, Vol. 46, Bo. 30, pp. 7427-7536, Oct. 2007.
11. **C.D. Creusere, K. Kallakuri, and R. Vanam**, "An Objective Metric of Human Subjective Audio Quality Optimized for a Wide Range of Audio Fidelities," *Audio, Speech, and Language Processing, IEEE Transactions on [see also Speech and Audio Processing, IEEE Transactions on]* , vol.16, no.1, pp.129-136, Jan. 2008
12. **S. Kandadai and C.D. Creusere**, "Scalable Audio Compression at Low Bitrates," *Audio, Speech, and Language Processing, IEEE Transactions on [see also Speech and Audio Processing, IEEE Transactions on]* , vol.16, no.5, pp.969-979, July 2008
13. **S. Kandadai and C.D. Creusere**, "Reverse engineering and repartitioning vector quantizers using training set synthesis," *Signal Processing*, August 2008.
14. **V. Thilak, C.D. Creusere, and D. Voelz** , "Passive Polarimetric Imagery-Based Material Classification Robust to Illumination Source Position and Viewpoint," *Image Processing, IEEE Transactions on* , vol.20, no.1, pp.288-292, Jan. 2011.

15. **C.D. Creusere and J. Hardin**, "Assessing the Quality of Audio Containing Temporally Varying Distortions," *Audio, Speech, and Language Processing, IEEE Transactions on* , vol.19, no.4, pp.711-720, May 2011.
16. **Castorena, J.; Creusere, C.D.**, "The Restricted Isometry Property for Banded Random Matrices," *Signal Processing, IEEE Transactions on* , vol.62, no.19, pp.5073-5084, Oct.1, 2014
doi: 10.1109/TSP.2014.2345350.
17. **Castorena, J.; Creusere, C.D.**, "Sampling of Time-Resolved Full-Waveform LIDAR Signals at Sub-Nyquist Rates," *Geoscience and Remote Sensing, IEEE Transactions on* , vol.53, no.7, pp.3791-3802, July 2015. doi: 10.1109/TGRS.2014.2383839.

REFEREED CONFERENCE PUBLICATIONS

1. **H. Babic, S.K. Mitra, C.D. Creusere, and A. Das**, "Perfect reconstruction recursive QMF banks for image subband coding," *Proc. Asilomar Conf. Signals, Systems, and Computers*, Pacific Grove, CA, Nov. 1991, pp. 746-750.
2. **S.K. Mitra, C.D. Creusere, and H. Babic**, "A novel implementation of perfect reconstruction QMF banks using IIR filters," *Proc. IEEE Int. Symposium on Circuits and Systems*, San Diego, CA, May 1992, pp. 2312-2315.
3. **S.K. Mitra, C.D. Creusere, and H. Babic**, "Design of transmultiplexers using IIR filter banks," *Signal Processing VI: Theories and Applications*, Elsevier Science Publishers, 1992, pp. 223-226.
4. **C.D. Creusere and S.K. Mitra**, "Efficient image scrambling using polyphase filter banks," *Proc. International Conference on Image Processing*, Austin, TX, Nov. 1994, pp. 81-85.
5. **C.D. Creusere and G. Hewer**, "Wavelet-based nearest neighbor pattern classification using scale sequential matching," *Proc. Asilomar Conf. Signals, Systems and Computers*, Pacific Grove, CA, Nov. 1994, pp. 1123-1127.
6. **C.D. Creusere**, "Embedded zerotree image coding using low complexity IIR filter banks," *Proc. Int. Conf. on Acoustics, Speech, and Signal Processing*, Detroit, MI, May 1995, pp. 2213-16.
7. **C.D. Creusere and Gary Hewer**, "Digital video compression for weapons control and bomb damage indication," *AGARD Conference Proceedings 576*, Chapter 16, Sept. 1995.
8. **C.D. Creusere**, "Image coding using parallel implementations of the embedded zerotree wavelet algorithm," *Proc. of the Digital Video Compression Conference (Algorithms and Technologies 1996)*, San Jose, CA, Jan. 28-Feb. 2, 1996, pp. 82-93.
9. **C.D. Creusere**, "A family of image compression algorithms which are robust to transmission errors," *Proceedings of the SPIE*, Vol. 2825, Denver, CO, August, 1996, pp. 890-900.
10. **C.D. Creusere**, "Perfect reconstruction time-varying IIR filter banks," *Conf. Rec. Asilomar Conf. Signals, Systems, and Computers*, Pacific Grove, CA, Nov. 1996, pp. 1319-23.
11. **C.D. Creusere**, "Out-of-loop motion compensation for reduced complexity video encoding," *Proc. of the Data Compression Conf.* (pp. 428) & *Data Compression Industry Workshop* (pp.28-37), March 1997, Snowbird, UT.
12. **C.D. Creusere**, "Periodic pan compensation for reduced complexity video compression," *Proc. Int. Conf. on Acoustics, Speech, and Signal Processing*, Vol IV, pp. 2889-92, April 1997, Munich, Germany.
13. **C.D. Creusere**, "A new approach to global motion compensation which reduces video encoding complexity," *Proc. Int. Conf. on Image Processing*, Vol. III, pp. 634-7, October 1997, Santa Barbara, CA.
14. **C.D. Creusere**, "Spatially partitioned lossless image compression in an embedded framework," *Conf. Rec. 31st Asilomar Conf. on Signals, Systems, and Computers*, Nov. 1997, Pacific Grove, CA.
15. **C.D. Creusere**, "Adaptive embedding for reduced complexity image and video compression," *Proc. of the SPIE*, Vol 3309 (Visual Communications and Image Processing), pp. 48-57, Jan. 1998, San Jose, CA.

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