

Huisheng Wang (Ms)

University of Southern California

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Research Interests: Signal processing, multimedia compression and communication

- Network-aware multimedia communication, including rate-distortion optimized video streaming and peer-to-peer (P2P) streaming
- Distributed source coding including Slepian-Wolf and Wyner-Ziv coding
- Scalable video coding, multiple description coding, and multiple description layered coding
- Algorithms for rate-distortion optimization and advanced compression

Education:

- 08/00-present **Ph.D.** in Electrical Engineering, University of Southern California, Los Angeles, CA (GPA: 4.0/4.0)
Fields of Specialty: Signal and image processing, multimedia coding and communication
Thesis: Algorithms for scalable and network-adaptive video coding and transmission
Advisor: Professor Antonio Ortega
- 08/00–05/02 **M.S.** in Electrical Engineering (Computer Networks), University of Southern California, Los Angeles, CA (GPA: 4.0/4.0)
- 01/96–02/97 **M.Eng.** in Electrical Engineering (Power Systems), Nanyang Technological University, Singapore
Thesis: Neurofuzzy implementation of digital protection for power transmission systems
Advisor: Professor W.W.L. Keerthipala
- 09/91–07/95 **B.S.** in Electrical Engineering, Xi'an Jiaotong University, China (GPA: 91/100)

Professional Experience:

- 08/00-present **University of Southern California, Los Angeles, CA**
- 08/00-present **Research assistant**
- Network-adaptive multimedia communication: (1) Multiple description layered coding (MDLC) by combining scalability and multiple description coding techniques, and (2) Rate-distortion adaptive streaming of video with multiple decoding paths. The source is compressed into multiple redundant versions to provide enhanced flexibility to various network conditions.
 - Distributed video coding: (1) Wyner-Ziv scalable predictive video coding with low encoding complexity and improved coding performance, (2) video compression with flexible playback order based on distributed source coding, and (3) study of trade-off between entropy coding and distributed source coding.
- 01/03–05/03 **Teaching assistant**
- 05/04–08/04 **Research Intern, HP Labs, Palo Alto, CA**
 & Mentor: Dr. Debargha Mukherjee
- 02/05–05/05
- Format-agnostic bit-stream adaptation using the MPEG-21 DIA framework
 - Network-aware secure delivery of multimedia over networks
 - Video coding with two-dimensional direction-adaptive transforms (e.g., Ridgelets)

- 05/03–08/03 **Research Intern, La Jolla Lab, STMicroelectronics, San Diego, CA**
Mentor: Dr. George Chen
Code multi-view video streams using an MPEG-4 temporal scalability based approach
- 03/97–08/00 **Creative Technology Ltd**
03/97–08/00 **R&D Software Engineer, Creative Technology Ltd, Singapore**
Developed device drivers for Sound Blaster cards including the Sound Blaster Live! series and AWE64 digital; designed and implemented DSP algorithms for audio processing.
- 05/99–06/00 **R&D Software Engineer, Creative Advanced Technology Center, Scotts Valley, CA**
Developed Environmental Audio Extensions (EAX) drivers and APIs with DSP research group. EAX enhances Microsoft's DirectSound3D to enable the reproduction of environmental reverberation, reflections, and the effects of obstacles in a virtual 3D world.
- 01/96–02/97 **Research Scholar, Nanyang Technological University, Singapore**
Designed a real-time fault diagnostic system on power transmission lines by using neuro-fuzzy techniques. Set up an on-line test system with a Real Time Digital Simulator (RTDS) attached to a Sun Workstation and a TMS320C31 DSP system to assess the performance.

Honors and Awards:

- **Dissertation Completion Fellowship**, University of Southern California, 2006.
- **Postgraduate Research Scholarship**, Nanyang Technological University, 1996-1997.
- **International Exchange Scholarship** provided by OCBC Bank Singapore, awarded to only two students selected from about 3,000 undergraduate seniors at Xi'an Jiaotong University, 1995.
- **Logic Awards** awarded to top 10 students at Xi'an Jiaotong University, 1994.
- **Excellent Student Awards**, Xi'an Jiaotong University, 1992-1995.
- **Excellent Academic Scholarship**, Xi'an Jiaotong University, 1992-1995.

Publications:

Book Chapter

- [1] Antonio Ortega and **Huisheng Wang**. Bandwidth adaptation mechanisms. Book chapter in *Multimedia over IP Wired and Wireless Networks*, Eds. Philip A. Chou and Mihaela van der Schaar, Elsevier Science, to be published.

Journals

- [1] **Huisheng Wang** and Antonio Ortega. Rate-distortion adaptive streaming of video with multiple decoding paths. In preparation, to be submitted to *IEEE Trans. Circuits and Systems for Video Technology*.
- [2] Ngai-Man Cheung, **Huisheng Wang** and Antonio Ortega. Correlation estimation for distributed image and video coding under rate and complexity constraints. In preparation, to be submitted to *IEEE Trans. Image Processing*.
- [3] **Huisheng Wang**, Ngai-Man Cheung and Antonio Ortega. A framework for adaptive scalable video coding using Wyner-Ziv techniques. *EURASIP Journal on Applied Signal Processing*, 2006.
- [4] **Huisheng Wang** and W.W.L. Keerthipala. Fuzzy-neuro approach to fault classification for transmission line protection. *IEEE Trans. Power Delivery*, Vol.13, No.4, 1998, pp.1093-1104.
- [5] W.W.L. Keerthipala, Chan Tat Wai and **Huisheng Wang**. Neural network based classifier for power system protection. *Journal of Electric Power System Research*, Elsevier Science, 1997.

Conferences

- [1] Ngai-Man Cheung, **Huisheng Wang** and Antonio Ortega. Video compression with flexible playback order based on distributed source coding. In *Proc. Visual Communications and Image Processing 2006*, Jan. 2006.
- [2] Ngai-Man Cheung, **Huisheng Wang** and Antonio Ortega. Correlation estimation for distributed source coding under information exchange constraints. In *Proc. Int'l Conf. Image Processing*, Sept. 2005.
- [3] Debargha Mukherjee, **Huisheng Wang**, Amir Said and Sam Liu. Format independent encryption of generalized scalable bit-streams enabling arbitrary secure adaptations. In *Proc. Int'l Conf. Acoustics, Speech, and Signal Processing*, Mar. 2005.
- [4] **Huisheng Wang** and Antonio Ortega. Rate-distortion based scheduling of video with multiple decoding paths. In *Proc. Image and Video Communications and Processing (EI'2005)*, Jan. 2005.
- [5] **Huisheng Wang**, Ngai-Man Cheung and Antonio Ortega. WZS: Wyner-Ziv scalable predictive video coding. In *Proc. Picture Coding Symposium*, Dec. 2004.
- [6] **Huisheng Wang** and Antonio Ortega. Scalable predictive coding by nested quantization with layered side information. In *Proc. Int'l Conf. Image Processing*, Oct. 2004.
- [7] Debargha Mukherjee, **Huisheng Wang**, Amir Said and Sam Liu. Format-agnostic adaptation using the MPEG-21 DIA framework. In *Proc. SPIE Applications of Digital Image Processing XXVII*, Aug 2004.
- [8] **Huisheng Wang** and Antonio Ortega. Robust video communication by combining scalability and multiple description coding techniques. In *Proc. Image and Video Communications and Processing (EI'2003)*, Jan. 2003.
- [9] W.W.L. Keerthipala, **Huisheng Wang**, and Chan Tat Wai. On-line testing of a fuzzy neural based protective relay using a real time digital simulator. In *IEEE Power Engineering Society Winter Meeting*, 2000.
- [10] W.W.L. Keerthipala, **Huisheng Wang**, and Chan Tat Wai. Experimental validation of a fuzzy-neuro based fault classifier for transmission line protection. In *Proc.IPEC'99 Conference*, May 1999.
- [11] **Huisheng Wang** and W.W.L. Keerthipala. Fuzzy-neuro based intelligent fault classifier for protection of power transmission lines. Invited paper. In *Proc. Int'l Symposium on Intelligent Automation and Control (ISIAC'98)*, May 1998.
- [12] **Huisheng Wang**, and W.W.L. Keerthipala. Fuzzy-neuro approach to fault classification for transmission line protection. In *Proc. Int'l Power Engineering Conference (IPEC'97)*, 1997.
- [13] **Huisheng Wang**, and W.W.L. Keerthipala. Fuzzy-neural-network approach to fault classification for protecting transmission lines. In *Proc. Forth International Conference on Control, Automation Robotics and Vision (ICARCV'96)*, 1996.

Standardization Contributions:

- [1] Debargha Mukherjee, **Huisheng Wang** and Sam Liu, "On BSD Transformation Instructions – Streaming Implementation and Updates", ISO/IEC JTC1/SC29/WG11, MPEG04/M11091, Jul. 2004.
- [2] George Chen, Ngai-Man Cheung, **Huisheng Wang**, Joaquin Lopez, Antonio Ortega, "Using inter-view prediction for multi-view video compression," MPEG2004/m10512, March 2004 (collaborate with STMicroelectronics).
- [3] George Chen, Kim Ng, and **Huisheng Wang**, "A Multi View Video Compression Scheme Based on Direct View Synthesis", ISO/IEC JTC1/SC29/WG11, MPEG2003/M10025, Oct. 2003, Australia.

Patents:

- [1] Debargha Mukherjee and **Huisheng Wang**, "Optimizing Video Coding", US patent application filed in Jun. 2006.
- [2] Kim Ng, Clifford Stein and **Huisheng Wang**, "Spatio-Temporal Graph-Segmentation Encoding for Multiple Video Steams", European patent application filed in Jan. 2006, US patent application filed in Jan. 2005.

- [3] Debargha Mukherjee and **Huisheng Wang**, "Secure Transmission of Generalized Scalable Bit-Streams", US patent application filed in Sept. 2004.
- [4] Sam Dicker, **Huisheng Wang**, Jean-Marc Jot, "Matrix Encoding System with Improved Frequency Behavior", United States Patent No. 6,453,047, Creative Technology Ltd., Sept. 2002.

Talks:

- [1] Multi-dimensional signal approximation and representation beyond wavelets. HP Labs, May 2005.
- [2] Ongoing research on network-adaptive video communication. La Jolla Lab, STMicroelectronics, Jul. 2003.
- [3] Conference talks at EI 2003, PCS 2004 and EI 2005.

Review Services:

- IEEE Trans. on Circuits and Systems for Video Technology
- IEEE Trans. on Image Processing
- ACM Transactions on Multimedia Computing, Communications and Applications (TOMCCAP)
- EURASIP Journal on Applied Signal Processing
- Several Conferences including ICASSP, ICIP and Globecom

Teaching Experience:

Spring 2003 EE 469: Introduction to digital media engineering, University of Southern California

Selected Courses Taken in USC:

Digital signal processing	Selected topics in digital image processing
Communication theory	Information theory
Wavelets	Error correcting code
Analysis of Algorithms	Computer communications
Computer networks	Broadband network architectures
Computer systems architecture	Wireless sensor networks
Operating systems	Advanced operating systems