
Sen-ching Samson Cheung

Center for Visualization and Virtual Environments
University of Kentucky
1 Quality Street, Suite 800
Lexington, KY 40507
<http://www.vis.uky.edu/mialab>

Work: 859-257-1257x80299
Fax: 859-257-1505
Home: -----
E-mail: sccheung@ieee.org

Education

- Ph.D.** **Electrical Engineering and Computer Sciences,**
 University of California, Berkeley, CA December 2002
Dissertation Title: *Efficient Video Similarity Measurement and Search*
Research Adviser: Avideh Zakhor
Thesis Committee: Avideh Zakhor, Larry Rowe, Ray Larson, and Alistair Sinclair
- B.S.** **Computer Engineering (summa cum laude)**
 University of Washington, Seattle, WA July, 1992
- HKCEE** **Equivalent to high school diploma in U.S.**
 La Salle Secondary School, Hong Kong July 1988

Professional Experiences

- 7/2004 – present** **Center for Visualization & Virtual Environments and Department of Electrical & Computer Engineering, University of Kentucky**
Assistant Professor
- 10/2002 –6/2004** **Center for Applied Scientific Computing, Lawrence Livermore National Laboratory**
Postdoctoral Researcher
- 1/1998 – 9/2002** **Video and Image Processing Laboratory, Department of Electrical Engineering and Computer Sciences, UC Berkeley**
Graduate Student Researcher
- 1/1995 –12/1997** **Research Group, VTEL Inc. (Formerly Compression Labs Inc.)**
Research Engineer
- 8/1992 – 12/1994** **Video and Image Processing Laboratory, Department of Electrical Engineering and Computer Sciences, UC Berkeley**
Graduate Student Researcher
- 7/1991- 7/1992** **Department of Computer Sciences, University of Washington**
Undergraduate Student Researcher

Awards and Newsworthy

- Senior Member of IEEE (2007)
- Research work featured in Research Channel documentary titled “Surveillance Privacy Protection” (2006) [<http://www.researchchannel.org/prog/displayevent.aspx?rID=5036&fID=1865>]
- Work in Scientific Data Mining at Lawrence Livermore National Lab won R&D 100 Award (2006) [https://computation.llnl.gov/casc/awards/sapphire_rd100.html]
- Research work featured in a news article from Quadrangle, magazine of the University of Kentucky College of Engineering, titled “Privacy: the other side of security” (2006) [<http://www.engr.uky.edu/comm/documents/winter2006quad.pdf>]
- Grant from Department of Homeland Security featured in University of Kentucky news [http://news.uky.edu/news/display_article.php?artid=478]
- Dissertation Work featured in a news article from Red Herring Magazine titled “Video Search’s Buried Treasure” (2006) [<http://www.redherring.com/Home/15224>]
- Finalist of DARPA Microsystems Technology Office (MTO) Young Faculty Award (2006)
- Ralph E. Powe Junior Faculty Enhancement Award from Oak Ridge Associated Universities (2005) [<http://www.orau.org/news/releases/2005/fy05-37.htm>]
- Best Poster Award in British Machine Vision Conference BMVC (2005)
- UC Berkeley Candidate for Microsoft Research Fellowship and Intel Research Fellowship (2000)
- Public Release of Matching Pursuit Video Codec with more than 5000 downloads (1999-2001)
- Recipient of National Science Foundation Fellowship (1992-1994)
- Cray Research Scholarship (1990-1992)
- Sophomore Medalist (first in sophomore class of University of Washington) (1989)
- Alcoa Foundation Scholarship (1989-1990)
- Member of Tau Beta Pi National Engineer Honor Society (1989-present)
- Member of Golden Key National Honor Society (1989-1992)

Invited Talks

- HP Labs, Palo Alto CA (Host: Dr. Wai-Tian Tan, March 2008)
- FX Palo Alto Laboratory, Inc. (Host: Dr. Larry Rowe, March 2008)
- University of California, Merced (Host: Professor Shawn Newsam, March 2008)
- Lawrence Livermore National Laboratory (Host: Dr. Chandrika Kamath, March 2008)
- Dong Hwa University (Host: Professor Mei-Juan Chen, Dec. 2007)
- Osaka University (Host: Professor Noboru Babaguchi, Dec. 2007)
- HP Labs Japan (Host: Dr. Gene Cheung, Dec. 2007)
- National Taiwan University (Host: Professor Shiao-Yi Chien, Dec. 2007)
- National Tsing Hwa University (Host: Professor Chia-Wan Lin, Dec. 2007)
- Hong Kong Chinese University (Host: Professor Ming-Hwa Chen, Dec. 2007)
- Hong Kong University of Sciences and Technologies (Host: Professor Oscar Au, Dec. 2007)
- University of Washington (Host: Professor Ming-Ting Sun, Sept. 2007)
- DARPA Young Faculty Award Workshop (Nov. 2006)
- Privacy Research in Vision Workshop of IEEE CVPR (Host: Professor Terrance Bolt, June. 2006)
- University of Washington (Host: Professor Ming-Ting Sun, Sept. 2005)
- National Taiwan University (Host: Professor Jia-Ling Wu, Jan. 2005)
- Hong Kong Polytechnic University (Host: Professor Wan-Chi Siu, October 2004)
- Institute for Infocomm Research, National University of Singapore (Host: Professor Qi Tian, October 2004)
- Thomson Electronics Lab, New Jersey (Host: Dr. Yin Peng, October 2004)
- Multimedia Workshop at Columbia University (Host: Professor Shih-Fu Chang, June 2004)

Sponsored Research Projects (sorted by end-date)**Privacy Protecting Video Surveillance**

Principal Investigator: **Sen-ching S. Cheung**
Co-P.I.: Ruigang Yang and Michael Hail
Funding Agency: Department of Homeland Security
Funding Amount: \$694,613 (January 2006 – July 2009)

Large Rapidly Deployable Immersive Visualization for Training and Simulation in Urban Terrains

Principal Investigator: Bruce Walcott
Co-P.I.: Ruigang Yang and **Sen-ching S. Cheung**
Funding Agency: United States Army
Funding Amount: \$910,332 (May 2006 – May 2009)

Anti-Sniper Infrared Targeting Systems (ASITS) Phase III

Principal Investigator: Daniel Lau
Co-P.I.: J. Heath, Laurence Hassebrook, William Dieter and **Sen-ching S. Cheung**
Funding Agency: M2 Technologies Inc.
Funding Amount: \$922,000 (January 2007 – July 2008)

Immersive and Interactive Spaces – NSF EPSCoR

Principal Investigator: Kevin Donohue
Senior Personnel: **Sen-ching S. Cheung** and others
Funding Agency: National Science Foundation
Funding Amount: \$2,700,000 (June 2005 – May 2008)

REU Site: Electrical & Computer Engineering at the University of Kentucky

Principal Investigator: Ingrid St. Omar
Co-P.I.: Daniel Lau and Jane Jensen
Senior Personnel: **Sen-ching S. Cheung** and others
Funding Agency: National Science Foundation
Funding Amount: \$259,365 (March 2006 – February 2008)

Privacy Protecting Video Surveillance

Principal Investigator: **Sen-ching S. Cheung**
Funding Agency: Oak Ridge Associated Universities (ORAU)
Funding Amount: \$5,000 (October 2005 – October 2006)

University of Kentucky Startup Fund

Principal Investigator: **Sen-ching S. Cheung**
Funding Agency: College of Engineering, University of Kentucky
Funding Amount: \$140,000 (August 2004 – August 2006)

Grant Proposals under review**Flexible Sensor and Projector Planning for Immersive Facility**

Principal Investigator: **Sen-ching S. Cheung**
Funding Agency: HP Research Labs
Date Submitted: June 18, 2008

NSF- IGERT: Enhancing Creativity and Innovation Through Visualization and Perceptual Alternatives (white paper)

Principal Investigator: Melody Garswell
Co-P.I.: **Sen-ching S. Cheung**, Gerry Swan and William Seales
Funding Agency: National Science Foundation
Date Submitted: April 24, 2008

Students Supervised

<u>Graduate Students</u>	<u>Degree (Year)</u>	<u>Thesis Title</u>
Nan Hu	M.S. (2007)	Secure Image Processing
Jayashri Chaudhari	M.S. (2007)	Privacy Protection for Life-log System
Vijay Venkatesh Mahalingam	Ph.D. (Expected 2008)	Video and Image Inpainting
Viswajith Karapoondi Nott	M.S. (Expected 2008)	Embedded Privacy Camera System
Cheng Hao Chang	M.S. (Expected 2008)	Audio Privacy Protection with Voice Conversion
Jian Zhao	Ph.D. (Expected 2009)	Optimal Design and Evaluations of Camera Networks
Jithendra Parachuri	Ph.D. (Expected 2009)	Rate-Distortion Optimized Data-Hiding
Ying Lou	Ph.D. (Expected 2010)	Image Processing in Encrypted Domain

<u>Undergraduate Students</u>	<u>Degree (Year)</u>	<u>Project</u>
Van Yadeck	B.S. EE (2006)	Blind Source Separation in Microphone Array
James Senders	B.S. EE (Tennessee State)	Audio Segmentation in Life-log System
Mamode Olubusay Ufomata	B.S. EE (2005)	Image Segmentation for Laser Detection in Welding
Greg Schardein	B.S. EE (Expected 2008)	Calibration of RFID Tracking System
Felix Setyawan	B.S. EE (Expected 2008)	Multi-camera Visual Tracking System

<u>High School Students</u>	<u>Project</u>
Motoki Mizoguchi	Multi-camera Visual Tracking System (Expected 2008)

Teaching Experience

Instructor In-charge

Probabilistic Graphical Model (Graduate) - Fall 2005, Spring 2006, Spring 2008

- This is a graduate-level course that covers the fundamentals and the latest research in Probabilistic Graphical Models. Major topics include various types of graphical models, junction tree algorithm, belief propagation, model selections, and non-parametric techniques.
- Course website: <http://www.vis.uky.edu/~cheung/courses/ee639/sp06.html>

Multimedia Information System (Graduate) - Fall 2004

- This graduate-level course introduces important technologies and standards in building Multimedia Information Systems (MIS). The emphasis is on using signal processing and pattern recognition techniques for representing, coding, searching, visualizing and protecting multimedia information.
- Course website: http://www.vis.uky.edu/~cheung/courses/ee639_fall04/fall04.html

Signals and Systems II (Undergraduate) - Spring 2005, Fall 2005, Spring 2006, Fall 2006, Spring 2007

- This undergraduate-level course is a continuation of the analysis of signals and linear systems with an emphasis on feedback and discrete-time systems. Topics include the Laplace and Z-transforms, state-variable, discrete-time signal and system, analysis and design of digital filters, discrete and fast Fourier Transform.
- Course website: <http://www.vis.uky.edu/~cheung/courses/ee422G/sp07.html>

Signals and Systems I (Undergraduate) - Fall 2007

- This undergraduate-level core course provides an introduction to some of the essential modeling and analysis tools used by practicing engineers. The concepts covered include discrete and continuous LTI systems, convolution, Fourier series and transforms, Laplace transforms, modulation and bandwidth concepts.
- Course website: <http://www.vis.uky.edu/~cheung/courses/ee421G/fa07.html>

Professional Activities

- Member of Multimedia Systems & Applications Technical Committee of IEEE Circuits and Systems Society
- Chair of
 - Program Area (Privacy Issues) IEEE 5th International Conference on Advanced Video and Signal Based Surveillance (AVSS 2008)
 - Special Session on Privacy Protection of Visual Information in IEEE International Conference on Image Processing (ICIP 2008)
 - Special Invited Session on Video Surveillance in IEEE International Conference on Circuits and Systems (ISCAS 2008)
 - Poster Session of Computer Vision for Interactive and Intelligent Environments (CV4IIE 2005).
 - Session on Watermarking and Multimedia Processing in ACM Multimedia 2004.
- Panel reviewer for the Directorate for Computer and Information Science and Engineering (CISE) of the National Science Foundation (2004)
- Technical Program Committee Member of
 - IEEE SP Society International Workshop on Multimedia Signal Processing (MMSP 2008)
 - IEEE International Conference on Circuits and Systems (ISCAS 2008)
 - IEEE International Conference on Computer Vision and Pattern Recognition (CVPR 2008)
 - IEEE International Conference on Computer Vision (ICCV 2007)
 - IEEE First International Workshop on Multimedia Analysis and Processing (IMAP 2007)
 - IEEE International Conference on Advanced Information Networking and Applications (AINA-07)
 - IEEE International Conference on Multimedia & Expo 2005 (ICME 2005)
 - IADIS International conference WWW/Internet 2005
 - ACM Multimedia 2004
 - IEEE International Conference on Communications, Circuits and Systems (ICCCAS 2004)
- Representative of U.C. Berkeley in ISO Moving Picture Expert Group (MPEG) (1998)
- Company Representative in ITU (an international standard organization in telecommunication chartered by United Nation) Video Coding Expert Group (1995-1997)
- Reviewers for
 - IEEE International Conference on Image Processing (ICIP 2007)
 - IEEE International Conference on Image Processing (ICIP 2006)
 - IEEE International Conference on Computer Vision and Pattern Recognition 2006 (CVPR 2006)
 - IEEE International Conference on Advanced Video and Signal based Surveillance (AVSS 2006)
 - Advanced Concepts for Intelligent Vision Systems 2006 (ACVIS 2006)
- Regular reviewer for
 - EURASIP Journal on Applied Signal Processing
 - IEEE Transactions On Circuits and Systems for Video Technology
 - IEEE Transactions On Image Processing
 - IEEE Transactions On Multimedia
 - IEEE Transactions on Signal Processing
 - IEEE Signal Processing Letters
 - IEEE Transactions On Circuits and Systems II
 - ACM Transactions on Multimedia Computing, Communications, and Applications
 - Morgan Kaufmann Publishers
 - Member of ACM, IEEE

Patents and Inventions

1. Cheung, S.-C. and M. Chung. 2007. Efficient and Robust Identification of Partial Copies in Digital Video. University of Kentucky Intellectual Property 1479. United States Patent Application in preparation.
2. Cheung, S.-C. and J. Chaudhari. 2007. Audiovisual Privacy Protection for Portable Video Recording Devices. University of Kentucky Intellectual Property 1477. United States Patent Application in preparation.
3. Cheung, S.-C., J.K. Paruchuri and W. Zhang. 2007. Hiding Privacy Information in Surveillance Video. University of Kentucky Intellectual Property 1459. United States Patent Application in preparation.
4. Cheung, S.-C., N. Hu, and T. Nguyen. 2006. Secret Multi-Party Image Processing. University of Kentucky Intellectual Property 1418. United States Patent Pending.
5. Bagherjeiran, C. Harrison, E. Cantu-Paz, S.-C. Cheung, A. Gezahegne, N.-A. Tang, C. Kamath, C. Baldwin and I. Fodor. 2005. Sapphire-GAT Release version 1.0. Lawrence Livermore National Laboratory Invention IL# CP0108.
6. Cheung, S.-C. and C. Kamath. 2005. Detection of Moving Objects In A Video. Lawrence Livermore National Laboratory Invention IL#11330. United States Patent Pending.
7. Cheung, S.-C., D. Drizen, and P. Haskell. 2001. Video postfiltering with motion-compensated temporal filtering and/or spatial-adaptive filtering. United States Patent 6,178,205.
8. Neff, R., A. Zakhor, and S.-C. Cheung. 1998. *Matching-Pursuit Video Coding System*. Office of Technology Licensing, University of California, Berkeley. UCB Case No.: B96-009

Publications

Peer-reviewed Journal Articles (submitted)

1. Nguyen, T. and K. Nguyen and S.-C. Cheung. 2008. On Reducing Communication Energy Using Cross-Sensor Coding Technique. Submitted to **IEEE Transactions on Communications** on April 3, 2008.
2. Nguyen, K., T. Nguyen and S.-C. Cheung. 2008. Video Streaming with Network Coding. Submitted to **Journal of Signal Processing Systems** on February 1, 2008.

Peer-reviewed Journal Articles (accepted or appeared)

3. Zhao, J., S.-C. Cheung and T. Nguyen. 2008. Optimal Camera Network Configurations for Visual Tagging. Accepted to **IEEE Journal on Selected Topics in Signal Processing: special issue on distributed processing in vision networks** on May 1, 2008. <http://www.vis.uky.edu/~cheung/doc/jstsp08v3.pdf>
4. M., V. Venkatesh, S.-C. Cheung and J. Zhao. 2008. Efficient Object-Based Video Inpainting. Accepted to **Pattern Recognition Letter, Special Issue on Video-based Object and Event Analysis** on March 10, 2008. <http://www.vis.uky.edu/~cheung/doc/prl08v2.pdf>.
5. Tullimas, S., T. Nguyen, R. Edgecomb, S.-C. Cheung. 2008. Multimedia Streaming Using Multiple TCP Connections. To appear in **ACM Transactions on Multimedia Computing, Communications and Applications** Volume 4, Issue 3, August 2008. <http://www.vis.uky.edu/~cheung/doc/tomccap08.pdf>
6. Cheung, S.-C. and T. Nguyen. 2007. Secure Signal Processing between Distrusted Network Terminals. **EURASIP Journal on Information Security, special issue on signal processing in the Encrypted Domain**. Volume 2007 (2007), Article ID 51368. <http://www.hindawi.com/GetArticle.aspx?doi=10.1155/2007/51368>

7. Nguyen, T., K. Kolazhi, R. Kamath, S.-C. Cheung, D. Tran. 2007. Efficient Multimedia Distribution in Source Constraint Networks. Accepted to **IEEE Transactions on Multimedia** on 10/21/2007. <http://www.vis.uky.edu/~cheung/doc/multimedia07.pdf>
8. Cheung, S.-C., J. Chaudhari and J. Paruchuri. 2007. Privacy Protection of Human Speech. In **IEEE Pervasive Computing**, Work In Progress, Winter 2007, page 75. <http://www.vis.uky.edu/~cheung/doc/pervasive07.pdf>.
9. Cheung, S.-C. and C. Kamath. 2005. Robust Background Subtraction With Foreground Validation for Urban Traffic Video. In **EURASIP Journal of Applied Signal Processing**, New York, NY: Hindawi Publishing Co., Volume 14, pp. 1-11, August 2005. <http://www.vis.uky.edu/~cheung/doc/eurasip05.pdf>
10. Cheung, S.-C. and A. Zakhor. 2005. Fast similarity search and clustering of video sequences on the world-wide-web. In **IEEE Transactions on Multimedia**. Piscataway, NJ:IEEE. 7(3):524-538. <http://www.vis.uky.edu/~cheung/doc/mm2004.pdf>
11. Cheung, S.-C. and A. Zakhor. 2003. Efficient video similarity measurement with video signature. In **IEEE Transactions on Circuits, and Systems for Video Technology**. Piscataway. NJ:IEEE. 13 (1):59-74. <http://www.vis.uky.edu/~cheung/doc/csvt03.pdf>

Peer-reviewed Book Chapter

12. Zhao, J., S.-C. Cheung and T. Nguyen. 2008. Camera Network Configuration and its application in Privacy-protected Video Surveillance. To appear in **Multi-Camera Networks: Concepts and Applications**, edited by H. Aghajan and A. Cavallaro, Elsevier Science and Technology Book Group, 2008. http://www.vis.uky.edu/~cheung/doc/camera_network_chapter.pdf
13. Venkatesh, M. V., S.-C. Cheung, J. Paruchuri, J. Zhao and T. Nguyen. 2008. Protecting and Managing Privacy Information In Video Surveillance Systems. To appear in **Protecting Privacy in Video Surveillance**, edited by Andrew Senior, Springer, 2008. http://www.vis.uky.edu/~cheung/doc/privacy_chapter.pdf
14. Kamath, C., E. Cantu-Puz, S.-C. Cheung, I. K. Fodor, and N. A. Tang. 2005 Experiences in mining data from computer simulations. In **Next Generation of Data-Mining Applications**, edited by M. Kantardzic and J. Zurada, Wiley-IEEE Press pp. 211-233, March 2005. http://www.vis.uky.edu/~cheung/doc/sbor_book.pdf
15. Cheung, S.-C. and A. Zakhor. 2003. Efficient video similarity measurement with video signature. Chapter 28 of **Handbook of Video Databases: Design and Applications**, edited by B. Furht and O. Marques. CRC Press.

Peer-reviewed Conference Proceeding Articles

16. Venkatesh, M. V., J. Zhao and S.-C. Cheung. 2008. Privacy Protection for Video Conference. Submitted to ACM Multimedia 2008, October 27- November 1, Vancouver, BC.
17. Paruchuri, J., S.-C. Cheung and T. Nguyen. 2008. Managing Privacy Data In Pervasive Camera Networks. Invited paper to **IEEE International Conference on Image Processing (ICIP 08)**, October 12-15, 2008. <http://www.vis.uky.edu/~cheung/doc/icip08.pdf>. (Invited Paper)
18. Paruchuri, J. and S.-C. Cheung. 2008. Joint Optimization of Data Hiding and Video Compression. Accepted to **IEEE International Symposium on Circuits and Systems (ISCAS 08)**, May 18-21, Seattle, WA. <http://www.vis.uky.edu/~cheung/doc/iscas08.pdf>
19. Zhao, J. and S.-C. Cheung. 2007. Multi-Camera Surveillance with Visual Tagging and Generic Camera Placement. Accepted to **ACM/IEEE International Conference on Distributed Smart Camera (ICDSC 07)**, Sept. 25-28, Vienna, Austria. <http://www.vis.uky.edu/~cheung/doc/icdsc07.pdf>.

20. Nguyen, T., K. Nguyen and S.-C. Cheung. 2007. Peer-to-Peer Streaming with Hierarchical Network Coding. In **IEEE International Conference on Multimedia Expo (ICME 07)**, July 2-5, pages 396-399. <http://www.vis.uky.edu/~cheung/doc/icme07.pdf>
21. Chaudhari, J., S.-C. Cheung and M. V. Venkatesh. 2007. Privacy Protection for Lifelog Video. In **IEEE Signal Processing Society SAFE 2007: Workshop on Signal Processing Applications for Public Security and Forensics (SAFE 2007)**, April 11-13, pages 1-5. <http://www.vis.uky.edu/~cheung/doc/safe07.pdf>
22. Nan, H. and S.-C. Cheung, and T. Nguyen. 2007. A New Security Model for Secure Thresholding. In **IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2007)**, April 15-20, Volume II, pages 273-276. <http://www.vis.uky.edu/~cheung/doc/icassp07.pdf>
23. Cheung, S.-C., J. Zhao and M. V. Venkatesh. 2006. Efficient Object-based Video inpainting. In **IEEE International Conference on Image Processing (ICIP 2006)**, October 8-11, pages 705-708. <http://www.vis.uky.edu/~cheung/doc/icip06A.pdf>
24. Hu, Nan, S.-C. Cheung and T. Nguyen. 2006. Secure Image Filtering. In **IEEE International Conference on Image Processing ICIP 2006**, pages 1553-1556. <http://www.vis.uky.edu/~cheung/doc/icip06B.pdf>
25. M. V. Venkatesh and S.-C. Cheung. 2006. Symmetric Shape Completion Under Severe Occlusions. In **IEEE International Conference on Image Processing (ICIP 2006)**, October 8-11, pages 709-712. <http://www.vis.uky.edu/~cheung/doc/icip06C.pdf> (Invited Paper)
26. Nguyen, T., S.-C. Cheung and D. Tran. 2006. Efficient Video Dissemination in Structured P2P Networks. In **IEEE International Conference on Multimedia Expo, (ICME 2006)**, July 9-12, pages 1673-1676. <http://www.vis.uky.edu/~cheung/doc/icme06.pdf>
27. Nguyen T., D. Tran and S.-C. Cheung. 2005. Efficient P2P Data Dissemination in a Homogeneous Capacity Network Using Structured Mesh. In Proceedings of **International Conference on Multimedia Services Access Networks (MSAN 05)**, June 13-15 2005, Orlando FL. Piscataway, NJ:IEEE: 73-77. **Invited Paper.** <http://www.vis.uky.edu/~cheung/doc/msan05.pdf> (Invited Paper)
28. Grossmann, E., A. Kale, C. Jaynes and S-C. Cheung, 2005. Offline generation of high-quality background subtraction data. **British Machine Vision Conference 2005. Best Poster Award.** <http://www.vis.uky.edu/~cheung/doc/Grossmann05BMVC.pdf>
29. Zhang, W., S.-C. Cheung, and M. Chen. 2005. Hiding privacy information in video surveillance system. In **IEEE International Conference on Image Processing (ICIP 2005)**, September 11-14, Genova, Italy. Piscataway, NJ:IEEE: (3)868-871. <http://www.vis.uky.edu/~cheung/doc/icip05B.pdf>
30. Cheung, S.-C. and T. Nguyen. 2005. Mining arbitrary-length repeated patterns in television broadcast. In **IEEE International Conference on Image Processing (ICIP 2005)**, September 11-14, Genova, Italy. Piscataway, NJ:IEEE: (3) 181-184. <http://www.vis.uky.edu/~cheung/doc/icip05A.pdf>
31. Nguyen, T. and S.-C. Cheung. 2005. Multimedia Streaming Using Multiple TCP Connections. In **IEEE International Performance Computing and communications Conference (IPCCC 2005)**, April 2005. Piscataway, NJ:IEEE: 215-223. <http://www.vis.uky.edu/~cheung/doc/ipccc05.pdf>
32. Cheung, S.-C. and C. Kamath. 2004. Robust techniques for background subtraction in urban traffic video. **Proceedings of Electronic Imaging: Visual Communications and Image Processing 2004 (Part One)**, January 20-22 2004, San Jose, California. Bellingham, WA:SPIE. (5308):881-892. <http://www.llnl.gov/CASC/sapphire/pubs/UCRL-CONF-200706.pdf>
33. Cantú-Paz, E., S.-C. Cheung, and C. Kamath. 2004. Retrieval of similar objects in simulation data using machine learning techniques. **Proceedings of Electronic Imaging: Image Processing: Algorithms and Systems III**, January 19-21 2004, San Jose, California. Bellingham, WA:SPIE. (5298):251-258. <http://www.llnl.gov/CASC/sapphire/pubs/153866.pdf>

34. Cheung, S.-C. and A. Zakhor. 2003. Fast similarity search on video signatures. In **IEEE International Conference on Image Processing (ICIP 2003)**, September 14-17, 2003, Barcelona, Spain. Piscataway, N.J.:IEEE. (2):1-4. <http://www.vis.uky.edu/~cheung/doc/icip03.pdf>
35. Cheung, S.-C. and C. Kamath. 2003. Initial experiences with retrieving similar objects in simulation data. **Workshop on Mining Scientific and Engineering Datasets**, May 3, 2003, San Francisco, California. Philadelphia, PA:SIAM. 11-18. <http://www.llnl.gov/CASC/sapphire/pubs/151931.pdf>
36. Cheung, S.-C. and A. Zakhor. 2002. Efficient video similarity measurement with video signature. In **IEEE International Conference on Image Processing (ICIP 2002)**, September 22-25, 2002, Rochester, New York. Piscataway, NJ:IEEE. (1):621-624. <http://www.vis.uky.edu/~cheung/doc/icip02.pdf>
37. Cheung, S.-C. and A. Zakhor. 2001. Video similarity detection with video signature clustering. In **IEEE International Conference on Image Processing (ICIP 2001)**, October 7-10, 2001, Thessaloniki, Greece. Piscataway, NJ:IEEE. (1):649-652. <http://www.vis.uky.edu/~cheung/doc/icip01.pdf>
38. Cheung, S.-C. and A. Zakhor. 2000. Efficient video similarity measurement and search. In **IEEE International Conference on Image Processing (ICIP 2000)**, September 10-13, 2000, Vancouver, BC, Canada. Piscataway, NJ:IEEE. (1):85-88. <http://www.vis.uky.edu/~cheung/doc/icip00.pdf>
39. Cheung, S.-C. and A. Zakhor. 2000. Estimation of web video multiplicity. **Proceedings of the SPIE - Internet Imaging**, January 23-28, San Jose, CA. Bellingham, WA:SPIE. (3964):34-36. <http://www.vis.uky.edu/~cheung/doc/spie00.pdf>
40. K. Bolding, S.-C. Cheung, S.-E. Choi, C. Ebeling, S. Hassoun, T. Ngo, R. Wille. 1993. The Chaos Router Chip: Design and Implementation of an Adaptive Router. **Proceedings of the International Conference on Very Large Scale Integration**, Sep 7-10 1993, Grenoble, Fr. Elsevier Science Publishers B.V., Amsterdam, Neth: 311-320. <http://wotug.ukc.ac.uk/parallel/simulation/communications/chaos/docs/chip.ps>

Non-refereed contributions to International Standard Bodies

41. Cheung, S.-C. and A. Zakhor. 1998. Matching Pursuit coding for fine granular video scalability. **MPEG WG11 Meeting**, October 12-16, 1998, Atlantic City, NJ. Document M3991.
42. Cheung, S.-C. and A. Zakhor. 1998. Cost and benefit analysis for Matching Pursuits as a version 2 tool. **MPEG WG11 Meeting**, July 6-10, 1998, Dublin, Ireland. Document M3834.
43. Miloslavsky, E., S.-C. Cheung, and A. Zakhor. 1998. Scalability using Matching Pursuits. **MPEG WG11 Meeting**, July 6-10, 1998, Dublin, Ireland. Document M3832.
44. Cheung, S.-C., R. Neff, and A. Zakhor. 1998. Changes regarding Matching Pursuits in video VM V.11. **MPEG WG11 Meeting**, July 6-10, 1998, Dublin, Ireland. Document M3832.
45. Cheung, S.-C. and A. Zakhor. 1998. Comments on m3247 "Subband dictionaries for low cost Matching Pursuits". **MPEG WG11 Meeting**, March 16-20, 1998, Tokyo, Japan. Document M3507.
46. Gupta, S. and S.-C. Cheung. 1997. Support of H.263+ on H.320. **ITU-T Study Group 16 Q11 Meeting**, December 2-5, 1997, Eibsee, Germany. Document Q11c42..
47. Johansen T., S.-C. Cheung, and S. Bhagat. 1997. Mandatory support of H.320 and H.Dispatch for H.324I terminals. **ITU-T Study Group 16 Q11 Meeting**, September 8-11, 1997, Sunriver, OR. Document Q11b56.
48. Cheung, S.-C. 1997. Should we use SAC with Slice? **ITU-T Study Group 16 Q15 Meeting**, September 8-11, 1997, Sunriver, OR. Document Q15b60.

49. Cheung, S.-C., M. Chen, and D. Klenke. 1997. Support of H.263+ on H.320. **ITU-T Study Group 16 Q11 Meeting**, June 24-27, 1997, Portland, OR. Document Q11a31.
50. Cheung, S.-C., G. Campbell, S. Gupta, D. Klenke. 1996. Proposal on H.263+ support for flexible frame rate, frame sizes, and pixel aspect ratios. **ITU-T Study Group 15 LBC Meeting**, November 11-14, 1996, Atlanta, GA. Document LBC96302.
51. Cheung, S.-C. 1996. Proposal on a new region proposal. **ITU-T Study Group 15 LBC Meeting**, July 15-18, 1996, Shepperton, U.K. Document LBC96213.

References

Provided upon request