

## **Jonathan J. Hull**

Ricoh California Research Center  
2882 Sand Hill Road, Suite 115  
Menlo Park, CA 94025

(650) 496-5723 (voice)  
(650) 854-8740 (fax)

[hull@crc.ricoh.com](mailto:hull@crc.ricoh.com)

### **Education**

- Ph.D., State University of New York at Buffalo, (Computer Science), February, 1988, Dissertation title:  
“A Computational Theory of Visual Word Recognition”.
- M.S., State University of New York at Buffalo, (Computer Science), 1983.
- B.A., State University of New York at Buffalo, (Computer Science and Statistics - double major), 1980.

### **Professional Experience**

1. Manager, Multimedia Document Analysis Group, Ricoh California Research Center, Menlo Park, CA, December, 1994 - present.
2. Associate Director, Center of Excellence for Document Analysis and Recognition, State University of New York at Buffalo (SUNYAB), November, 1990 - December, 1994.  
Research Associate Professor of Computer Science, September, 1993 - December, 1996.  
Research Assistant Professor of Computer Science, September, 1987 - September, 1993.
3. Visiting Senior Research Scientist, Ricoh California Research Center, Menlo Park, California, November, 1993 - May, 1994.
4. Research Associate (full time), Department of Computer Science, State University of New York at Buffalo, January, 1984 - September, 1987.
5. Teaching Assistant, Department of Computer Science, State University of New York at Buffalo, 1982 - January, 1984.
6. Research Assistant, Department of Computer Science, State University of New York at Buffalo, 1980 - 1982.

## **Jonathan J. Hull**

### **Honors**

- (1) Fellow, International Association for Pattern Recognition, September, 2000.
- (2) Outstanding Young Investigator, International Conference on Document Analysis and Recognition, Ulm, Germany, August 20, 1997.
- (3) Appreciation Award from the Chairman and President of Ricoh Silicon Valley, Inc., August 31, 1998. The citation reads: *In recognition for the original inspiration of the memory multifunction concept and its later reduction to practice and transfer to Ricoh Company, Ltd. This body of work has changed the way we operate at Ricoh Silicon Valley, provided a new starting point from which future research is considered and inspired business divisions throughout Ricoh.*

This work led directly to the introduction of two products by Ricoh: the *Ridoc Cabinet* (in Japan; formerly called *Saric*) and the *E-Cabinet* (in the U.S.).

### **Grants**

- (1) Principal Investigator, Unrestricted Grant in Support of Research, Ricoh Corporation, California Research Center, October 7, 1992; total amount: \$10,000.
- (2) Principal Investigator, Language Syntax to Improve OCR Performance, U.S. Government, June 1, 1991 to December 31, 1994; total amount: \$600,000.
- (3) Co-Principal Investigator (with S.N. Srihari), "Japanese Document Understanding," U.S. Government, September 1, 1993 to August 31, 1994; total amount: \$460,000.
- (4) Co-Principal Investigator (with S.N. Srihari), "Preliminary Address Recognition Unit Investigation," Office of Advanced Technology, United States Postal Service, December 1, 1990 to December 31, 1992; total amount: \$500,000.
- (5) Co-Principal Investigator (with S.N. Srihari), "Recognition of Handwritten ZIP Codes," Office of Advanced Technology, United States Postal Service, September 1, 1986 to December 31, 1992; total amount: \$1,752,698.
- (6) Co-Principal Investigator (with S.N. Srihari), "Use of Contextual Information for Automatic Postal Address Interpretation," Office of Advanced Technology, United States Postal Service, August 1, 1988 to December 31, 1992; total amount: \$1,089,997.
- (7) Co-Principal Investigator (with S.N. Srihari), "Remote Bar Coding Handwritten ZIP Code Recognition," Office of Advanced Technology, United States Postal Service, August 14, 1989 to November 30, 1990; total amount \$401,192.

### **Thesis Committees**

- (1) Chi Fang, Ph.D., "Word-based Substitution Cipher for Text Recognition," Computer Science, July, 1997 (chairman).
- (2) Tao Hong, Ph.D., "Integrated Visual and Language Constraints for Text Recognition," Computer Science, September, 1995 (chairman).
- (3) Siamak Khoubyari, M.S., "Word Image Matching for Text Recognition," Computer Science, May, 1992 (chairman).
- (4) Stephen W. Lam, Ph.D., "A computational framework for adaptive reading in document image understanding," Computer Science, October, 1994 (member).

## **Jonathan J. Hull**

- (5) Jaeyoung Rhi, Ph.D., "The Analysis of Orientationally Selective Edge Operators and Orientation Response Profile (ORP) Based Curvature Detection," Computer Science, October, 1993 (member).
- (6) Mou-Yen Chen, Ph.D., "Cursive script word recognition with a hidden Markov model," Electrical and Computer Engineering, September, 1993 (outside reader).
- (7) Craig Burgler, M.S. project, "A histogram-based neural network character recognition algorithm," May, 1993 (chairman).
- (8) Tin Kam Ho, Ph.D., "A Multiple Classifier Approach to Visual Word Recognition," Computer Science, May 1992, (co-chairman).
- (9) Ginige De Silva, M.S., "Syntax-Directed Text Segmentation in Page Layout Analysis," Electrical and Computer Engineering, September, 1993 (co-chairman).
- (10) Dipankar Talukdar, M.S., "An adaptive thresholding technique and its VLSI implementation," May, 1993 (member).
- (11) Chandra Bharathi, M.S., "A run-length coded data structure for database compression and its implementation," May, 1993 (member).
- (12) Sanjay Fotedar, M.S., "Multiple simultaneous Hough transform implementation in parallel hardware," January, 1993 (member).
- (13) Madhu Srinivasan, M.S. "Simulation of a laboratory mail sorting unit," May, 1993 (member).
- (14) Kenneth N. Smith, M.S., "RDS: A Remote Device Access System for Unix," Electrical and Computer Engineering, April, 1990, (member).
- (15) John Favata, Ph.D., "Recognition of Handwritten Words Using a Multi-level Generate-and-test Methodology," Computer Science, December, 1992 (member).

## **Professional Activities**

Member, Program Committee, International Conference on Document Analysis and Recognition, Seoul, Korea, Aug. 29 - Sept. 1, 2005.

Member, Program Committee, Document Engineering Track, ACM Symposium on Applications of Computing, Santa Fe, New Mexico, March 13-17, 2005.

Member, Program Committee, IEEE Workshop on Applications of Computer Vision, Breckenridge, CO, Jan. 5-7, 2005.

Member, Program Committee, Third International Conference on Mobile and Ubiquitous Multimedia, College Park, MD, Oct. 27-29, 2004.

Session Chair, International Conference on Pattern Recognition, Cambridge, U.K., Aug. 24, 2004.

Member, Program Committee, Workshop on Document Imaging and Analysis for Libraries, Palo Alto Research Center, Palo Alto, CA, Jan. 14-16, 2004.

Member, Program Committee, Workshop on Document Analysis and Information Retrieval, IEEE Conference on Computer Vision and Pattern Recognition, Madison, Wisconsin, June 16-22, 2003.

Member, Program Committee, IEEE Conference on Computer Vision and Pattern Recognition, Madison, Wisconsin, June 16-22, 2003.

**Jonathan J. Hull**

Member, Program Committee, Document Recognition and Retrieval X, SPIE Conference, San Jose, California, January 20-24, 2003.

Member, Program Committee, Document Recognition and Retrieval IX, SPIE Conference, San Jose, California, January 21-22, 2002.

Member, Program Committee and Session Chair, Sixth International Conference on Document Analysis and Recognition (ICDAR01), (sponsored by IAPR), Seattle, Washington, September, 2001.

Member, Program Committee and Session Chair, Document Recognition and Retrieval VIII, SPIE Conference, San Jose, California, January 26-27, 2001.

Member, Program Committee, Fifth IEEE Workshop on Applications of Computer Vision (WACV 2000), Palm Springs, CA, December 4-6, 2000.

Member, Program Committee, IWFHR-VII, Seventh International Workshop on Frontiers in Handwriting Recognition, (sponsored by IAPR), Amsterdam, The Netherlands, September 11-13, 2000.

Member, Program Committee, IEEE Conference on Computer Vision and Pattern Recognition, Hilton Head, South Carolina, June 13-15, 2000.

Member, Selection Committee for Editor-in-Chief, IEEE Transactions on Pattern Analysis and Machine Intelligence, May, 2000.

Member, Program Committee and Session Chair, Document Recognition and Retrieval VII, SPIE Conference, San Jose, California, January 26-27, 2000.

Member, Program Committee, Document Recognition and Retrieval VI, SPIE Conference, San Jose, California, January 27-28, 1999.

Co-chair, Program Committee, Fifth International Conference on Document Analysis and Recognition (ICDAR99), (sponsored by IAPR), Bangalore, India, September, 1999.

Member, Program Committee and Session Chair, Third IAPR Workshop on Document Analysis Systems, Nagano, Japan, November, 4-6, 1998.

Co-chair, Program Committee, Sixth International Workshop on Frontiers in Handwriting Recognition, Taejon, Korea, September, 1998.

Member, Best Industrial Paper Committee, International Association for Pattern Recognition (IAPR) International Conference on Pattern Recognition (ICPR), Brisbane, Australia, September, 1998.

Member, Program Committee, IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR98), Santa Barbara, CA, June 23-25, 1998.

Session Chair, Document Recognition V, SPIE Conference, San Jose, California, January 27-29, 1998.

Session Chair, Fourth International Conference on Document Analysis and Recognition, (sponsored by IAPR), Ulm, Germany, August 18-20, 1997.

Member, Program Committee, IEEE Computer Society Workshop on Document Image Analysis, San Juan, Puerto Rico, June 20, 1997.

Co-Chair, Document Recognition IV, SPIE Conference, San Jose, California, February 8 – February 14, 1997.

Co-Chair, IAPR Workshop on Document Analysis Systems, Malvern, Pennsylvania, October 14-16, 1996.

Member, Program Committee, Fifth International Workshop on Frontiers in Handwriting Recognition (IWFHR5), (sponsored by IAPR), University of Essex, England, September 2-5, 1996.

## Jonathan J. Hull

Member, Program Committee, SSPR'96, IAPR International Workshop on Structural and Syntactic Pattern Recognition, Leipzig, Germany, August 20-23, 1996.

Member, Program Committee for Document Analysis, Fifth Annual Symposium on Document Analysis and Information Retrieval, University of Nevada at Las Vegas, April, 1996.

Co-Chairman, Document Recognition III, SPIE Conference, San Jose, California, January 28 – February 2, 1996.

Co-chairman, Publicity Committee, and Session Chairman, ICDAR '95: Third International Conference on Document Analysis and Recognition, (sponsored by IAPR), Montreal, Canada, August 14-16, 1995.

Member, Program Committee for Document Analysis, Fourth Annual Symposium on Document Analysis and Information Retrieval, University of Nevada at Las Vegas, April, 1995.

Session Chairman, Document Recognition Conference, IS&T/SPIE 1995 International Symposium on Electronic Imaging: Science and Technology, San Jose, California, February, 1995.

Member, Organizing Committee, IAPR Workshop on Document Analysis Systems (DAS94), Kaiserslautern, Germany, October 18-20, 1994.

Chair, Program Committee for Document Analysis, Third Annual Symposium on Document Analysis and Information Retrieval, University of Nevada at Las Vegas, April 11-13, 1994.

Member, Systems Committee, Second Census Optical Character Recognition Systems Conference, Sponsored by the United States Bureau of the Census, conducted by the National Institute of Standards and Technology (formerly NBS), January, 1994.

Session Chair, Session on Databases for OCR, International Conference on Document Analysis and Recognition, (sponsored by IAPR), Tsukuba Science City, Japan, October 20-22, 1993.

Session Chair, Panel on Issues in Database Design, NATO Advanced Study Institute on Fundamentals in Handwriting Recognition, Chateau de Bonas, France, June 21 - July 3, 1993.

Member, Organizing Committee and Chair of Panel on Databases, Third International Workshop on Frontiers in Handwriting Recognition, (sponsored by IAPR), SUNY at Buffalo, Buffalo, NY, May 25-27, 1993.

Member, Program Committee, Symposium on Document Analysis and Information Retrieval, University of Nevada at Las Vegas, April 26-28, 1993.

Session Chair, Classification and Recognition Systems, Character Recognition Technologies Conference, IS&T/SPIE 1993 International Symposium on Electronic Imaging: Science and Technology, San Jose, California, February 1-2, 1993.

Co-chair, International Association for Pattern Recognition (IAPR) TC-11 Subcommittee on Databases for Off-Line Handwriting Recognition, September, 1992 - September, 1994. Result: CDROM database published by CEDAR and USPS. Described in paper in IEEE PAMI, May, 1994.

Member, Systems Committee, First Census Optical Character Recognition Systems Conference, Sponsored by the United States Bureau of the Census, conducted by the National Institute of Standards and Technology (formerly NBS), May 27-28, 1992.

Member, Panel on Imaging Problems and Solutions Workshop on Character Recognition and Digitizer Technologies, 1992 SPIE/IS&T Symposium on Electronic Imaging: Science and Technology, San Jose, California, February 11, 1992.

Member, Scientific Committee, and Session Chairman, Second International Workshop on Frontiers in Handwriting Recognition, Bonas, France, September 23-27, 1991.

## **Jonathan J. Hull**

Session Chair, Fourth USPS Advanced Technology Conference, Washington, D.C., November 5, 1990.

Co-chair - Discussion Group on OCR and Session Chairman, Workshop on Syntactic and Structural Pattern Recognition, Murray Hill, New Jersey, June 13-15, 1990.

Co-chair, Subcommittee on Databases for Handwriting Recognition, International Workshop on Frontiers in Handwriting Recognition, April, 1990 - 1992.

Co-chair - General Session and Session Chair, International Workshop on Frontiers in Handwriting Recognition, Montreal, Canada, April 3, 1990.

Chair (Acting), Committee on Text Processing (TC-11), International Association for Pattern Recognition, ICPR, Rome, Italy, November, 1988.

Session Chair, International Conference on Pattern Recognition, Rome, Italy, November, 1988.

### **Invited Presentations**

October 9, 1995, "Content Based Retrieval for Document Images," University of California at Berkeley, Digital Libraries Seminar.

August 13, 1995, "Databases in Handwritten Text Recognition Research," Tutorial presentation at the Third International Conference on Document Analysis and Recognition (ICDAR), (sponsored by IAPR) Montreal, Canada.

July 27, 1995, "Techniques for Document Image Database Retrieval and OCR," University of Nebraska at Lincoln, Symposium on Trends in Document Analysis.

May 19, 1995, "Combinations of Visual and Language Information in Text Recognition," Xerox Palo Alto Research Center, Machine Perception Seminar, Palo Alto, California.

October 17, 1994, "Language Constraints in Text Recognition," AEG - Daimler Benz Research Institute, Ulm, Germany.

August 5-6, 1994, "Language Syntax in OCR" and "Handwritten Postal Address Recognition," University of Nebraska at Lincoln, Symposium on Trends in Document Analysis.

May 26, 1994, "Language-level Information in Text Recognition," OCR Research Group, IBM Research Center, Almaden, California.

September 27, 1993, "Language Models for Improving OCR Performance," SUNY at Stony Brook, Department of Computer Science.

June 21, 1993, "Language-level Syntactic and Semantic Constraints Applied to Word Recognition," and "Large Database Organization for Document Images," NATO Advanced Study Institute on Fundamentals in Handwriting Recognition, Chateau de Bonas, France.

May 20-22, 1993, "Text recognition techniques in OCR systems," Korean National Conference on Character Recognition, Chungbuk University, Republic of Korea.

February 2, 1993, "Language-level syntactic constraints in OCR processes," Fuji Xerox Palo Alto Laboratory, Palo Alto, California.

December 7, 1991, "Evaluation of Character Recognition Algorithms," NIPS Workshop on Neural Networks for Handwriting Recognition, Denver, Colorado.

July 9-10, 1991, "Text Recognition Algorithms and Research Directions," Industrial Technical Research Institute, Hsinchu, Taiwan, Republic of China.

**Jonathan J. Hull**

October 15, 1990, "Evaluation Methods for Laboratory Character Recognition," National Institute of Standards and Technology (formerly the National Bureau of Standards), Washington, D.C.

June 27, 1990, "State of the Art in Handwritten Character Recognition," MITRE Conference on Document Imaging in the Federal Government, Washington, D.C.

April 2, 1990, "Multiple Algorithms for Handwritten Character Recognition," International Workshop on Frontiers in Handwriting Recognition, Montreal, Canada.

February 9, 1989, "Language Syntax in Visual Word Recognition," AT&T Bell Laboratories, Murray Hill, New Jersey.

August 24, 1988, "Feature Selection and Language Syntax in Text Recognition," COST-13 Workshop: From The Pixels to the Features, Bonas, France.

May 20, 1987, "A Computational Model for Human and Machine Reading," SPSE 40th Annual Symposium on Hybrid Imaging Systems, Rochester, New York.

Jonathan J. Hull

### Consulting Experience

Arvin/Calspan Advanced Technology Center, Buffalo, New York. Algorithmic design for automatic fingerprint classification for the Federal Bureau of Investigation, 1991.

### Professional Society Memberships

1. Association for Computing Machinery, 1980 - present.
2. Institute of Electrical and Electronics Engineers, Computer Society, 1981 - present.
3. Association for Computational Linguistics, 1982 - 1992.
4. American Association for Artificial Intelligence, 1983 - 1990.
5. Pattern Recognition Society, 1983 - present.

### Referee Activities

- (1) **Area Editor**, *Computer Vision and Image Understanding*, February, 1999 - present.
- (2) **Associate Editor**, *Pattern Recognition*, 1989 - present.
- (3) **Member, Editorial Board**, *International Journal on Document Analysis and Recognition*, 1998 - present.
- (4) **Associate Editor**, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, December, 1994 - December, 1998.
- (5) **Referee**: Machine Vision and Applications, Computer Vision, Graphics, and Image Processing: Image Understanding, International Journal of Pattern Recognition and Artificial Intelligence, IEEE Transactions on Fuzzy Systems, Journal of Visual Communication and Image Representation, IEEE Computer, Optical Engineering, IEEE Transactions on Systems, Man, and Cybernetics, IEEE Transactions on Software Engineering, International Conference on Pattern Recognition, 1988, 1998, International Conference on Document Analysis and Recognition, 1991, 1995, 1997.

### Publications

#### books

- [1]. J.J. Hull and S.L. Taylor (editors), "Document Analysis Systems II," World Scientific Publishing Co., 1998.
- [2]. L. Vincent and J.J. Hull (editors), "Document Recognition IV," Society for Photo-optical Instrumentation Engineers, 1997.
- [3]. L. Vincent and J.J. Hull (editors), "Document Recognition III," Society for Photo-optical Instrumentation Engineers, 1996.

#### journal papers

**Jonathan J. Hull**

- [1]. J.J. Hull and P.E. Hart, "Toward Zero-Effort Personal Document Management," *IEEE Computer*, v. 34, no. 3, March, 2001, 30-35.
- [2]. J.J. Hull and P.E. Hart, "Towards zero-effort personal document management: A new paradigm for users," *Imaging and Visual Computing*, v. 29 no. 3, 2000, 232-238.
- [3]. D.S. Lee and J.J. Hull, "Detecting Duplicates Among Symbolically Compressed Images in a Large Document Database," *Pattern Recognition Letters*, Special Issue on Image and Video Indexing, v. 22, April, 2001, 545-550.
- [4]. J.J. Hull, "Document image similarity and equivalence detection," *International Journal on Document Analysis and Recognition*, v. 1 no. 1, February, 1998, 37-42. Invited to appear.
- [5]. J. Zhu, T. Hong, and J.J. Hull, "Image-based keyword recognition in oriental language document images," *Pattern Recognition*, vol. 30, no. 8, August, 1997, 1293-1300.
- [6]. J.J. Hull, "Performance evaluation for document analysis," *International Journal of Imaging Systems and Technology*, vol. 7, 1996, 357-362.
- [7]. J.J. Hull, "Incorporating language syntax in visual text recognition with a statistical model," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 18, no. 12, December, 1996, 1251-1256.
- [8]. S. Khoubyari and J.J. Hull, "Font and function word identification in document recognition," *Computer Vision and Image Understanding*, Vol. 63, No. 1, January, 1996, 66-74.
- [9]. E. Cohen, J.J. Hull, and S.N. Srihari, "Control structure for interpreting handwritten addresses," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, October, 1994, 1049-1055.
- [10]. J.J. Hull, "A database for handwriting recognition research," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, May, 1994, 550-554.
- [11]. G. DeSilva and J.J. Hull, "Proper noun detection in document images," *Pattern Recognition*, February, 1994, 311-320.
- [12]. T.K. Ho, J.J. Hull, and S.N. Srihari, "Decision combination in multiple classifier systems," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, v. 16, 1, January, 1994, 66-75.
- [13]. T.K. Ho, J.J. Hull, S.N. Srihari, "A word shape analysis approach to lexicon based word recognition," *Pattern Recognition Letters*, November, 1992, 821-826.
- [14]. T.K. Ho, J.J. Hull, S.N. Srihari, "A computational model for recognition of multifont word images," *Machine Vision and Applications*, vol. 5, no. 3, summer 1992, 157-168.
- [15]. E. Cohen, J.J. Hull, and S.N. Srihari, "Understanding handwritten text in a structured environment: determining ZIP Codes from addresses," *International Journal of Pattern Recognition and Artificial Intelligence*, Vol. 5, No. 1 & 2, 1991, 221-264.
- [16]. D. Sher and J.J. Hull, "Quantifying the unimportance of prior probabilities in a computer vision problem," *Pattern Recognition Letters*, June, 1990, 379-383.
- [17]. S.N. Srihari, E. Cohen, J.J. Hull, and L. Kuan, "A System to locate and recognize ZIP Codes in handwritten addresses," *International Journal of Research and Engineering: Postal Applications*, inaugural issue, 1989, pp. 37-56.
- [18]. S.N. Srihari, C.H. Wang, P. W. Palumbo, and J.J. Hull, "Recognizing address blocks on mail pieces: Specialized tools and problem-solving architecture," *AI Magazine*, 8 (4), (Winter 1987), pp 25-40.

## Jonathan J. Hull

- [19]. J. J. Hull, "Hypothesis generation in a computational model for visual word recognition" *IEEE Expert*, August, 1986, pp. 63-70. Invited to appear.
- [20]. J.J. Hull, S.N. Srihari, and R. Choudhari, "An integrated algorithm for text recognition: Comparison with a cascaded algorithm," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, PAMI-5 (4), (July 1983), pp. 384-395.
- [21]. S.N. Srihari, J.J. Hull and R. Choudhari, "Integrating diverse knowledge sources in text recognition," *ACM Transactions on Office Information Systems*, 1 (1), (Jan. 1983), pp. 68-87. Appeared by invitation. Reviewed in *ACM Computing Reviews*, May 1983, review 40355.
- [22]. J.J. Hull and S.N. Srihari, "Experiments in text recognition with binary n-gram and viterbi algorithms," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, PAMI-4 (5), (Sept. 1982), pp. 520-530.

### chapters in books

- [1]. J.J. Hull, "Document image skew detection: Survey and annotated bibliography," in *Document Analysis Systems II*, J.J. Hull and S.L. Taylor (editors), World Scientific Publishing Company, 1998, 40-66.
- [2]. I. Guyon, R.M. Haralick, J.J. Hull, and I.T. Phillips, "Data sets for ocr and document image understanding research," *Handbook on Optical Character Recognition and Document Image Analysis*, H. Bunke and P. Wang (editors), World Scientific Publishing Company, 1996.
- [3]. J.J. Hull, "Incorporation of a Markov Model of Language Syntax in a Text Recognition Algorithm," in *Document Image Analysis*, L. O'Gorman and R. Kasturi (editors), IEEE Computer Society Press, 1995, 287-297, originally appeared in *Proceedings of the Symposium on Document Analysis and Information Retrieval*, University of Nevada at Las Vegas, March 16-18, 1992, 174-185.
- [4]. J.J. Hull, "Language-level syntactic and semantic constraints applied to visual word recognition," in *Fundamentals in Handwriting Recognition*, S. Impedovo (editor), Springer-Verlag, 1994, 289-312.
- [5]. J.J. Hull and R.K. Fenrich, "Large database organization for document images," in *Fundamentals in Handwriting Recognition*, S. Impedovo (editor), Springer-Verlag, 1994, 397-416.
- [6]. J.J. Hull, "Document image matching and retrieval with multiple distortion-invariant descriptors," in *Document Analysis Systems*, A. Lawrence Spitz and A. Dengel (editors), World Scientific, 1995, 379-396.
- [7]. J.J. Hull and T. Bayer, "Document analysis and learning," in *Document Analysis Systems*, A. Lawrence Spitz and A. Dengel (editors), World Scientific, 1995, 450-451.
- [8]. J.J. Hull and A.T. Chin, "Semantic information extraction with a thesaurus for visual word recognition," in *Advances in Structural and Syntactic Pattern Recognition*, H. Bunke (editor), World Scientific, 1992.
- [9]. T.K. Ho, J.J. Hull, and S.N. Srihari, "Combination of decisions by multiple classifiers," in *Structured Document Image Analysis*, Henry S. Baird, Horst Bunke, and Kazuhiko Yamamoto (editors), Springer Verlag, Berlin, 1992, 188-202.
- [10]. T. Bayer, J.J. Hull, and G. Nagy, "Character recognition: SSPR'90 working group report," in *Structured Document Image Analysis*, Henry S. Baird, Horst Bunke, and Kazuhiko Yamamoto (editors), Springer Verlag, Berlin, 1992, 565-567.

## Jonathan J. Hull

- [11]. J.J. Hull, T.K. Ho, J. Favata, V. Govindaraju, S.N. Srihari, "Combination of segmentation-based and wholistic handwritten word recognition algorithms," in *From Pixels to Features III*, S. Impedovo and J.C. Simon (editors), North-Holland, 1992.
- [12]. J.J. Hull, "Feature selection and language syntax in text recognition," in *From Pixels to Features*, J.C. Simon (editor), North-Holland, 1989, 249-260.

### encyclopedia articles

- [1]. S.N. Srihari and J.J. Hull, "Character recognition," in: *The Encyclopedia of Artificial Intelligence*, S.C. Shapiro (Editor), J. Wiley, New York, 1991.
- [2]. J.J. Hull, "Character recognition: The reading of text by computer," appeared in: *The Encyclopedia of Artificial Intelligence*, S.C. Shapiro (Editor), J. Wiley, New York, 1987, pp. 82-88.

### patents

- [1]. J. J. Hull, "Device for transferring data between an unconscious capture device and another device," United States Patent 6,772,338, Aug. 3, 2004.
- [2]. J. J. Hull, K. Piersol, M. Peairs, J. Cullen, and M. Baxter, "Method and system for automatically and transparently archiving documents and document meta data," United States Patent 6,704,118, Mar. 9, 2004.
- [3]. J. J. Hull, K. Suzuki, and K. Piersol, "Method for specifying the delivery information for electronic documents," United States Patent 6,684,368, Jan. 27, 2004.
- [4]. J. J. Hull and D. S. Lee, "Method and apparatus for simultaneous highlighting of a physical version of a document and an electronic version of a document," United States Patent 6,671,684, Dec. 30, 2003.
- [5]. J. J. Hull, M. Peairs, J. Cullen, and M. Baxter, "Automatic and transparent document archiving," United States Patent 6,665,086, Dec. 16, 2003.
- [6]. D. S. Lee and J. J. Hull, "Extracting information from symbolically compressed document images," United States Patent 6,658,151, Dec. 2, 2003.
- [7]. J. Cullen, J. J. Hull, M. Peairs, M. Nishimoto, and K. Suzuki, "Remote document image storage and retrieval system for a multifunctional peripheral," United States Patent 6,592,629, July 15, 2003.
- [8]. J. J. Hull, "Matching CCITT compressed document images," United States Patent 6,546,136, April 8, 2003.
- [9]. G. J. Wolff, K. Piersol, D. S. Lee, and J.J. Hull, "Generating labels indicating gaps in retrieval of electronic documents," United States Patent 6,526,398, Feb. 25, 2003.
- [10]. J.F. Cullen and J. J. Hull, "Search and retrieval using document decomposition," United States Patent 6,397,213, May 28, 2002.
- [11]. D.S. Lee and J.J. Hull, "Compressed document matching," United States Patent 6,363,381, March 26, 2002.
- [12]. "System for aligning document images when scanned in duplex mode," United States Patent 6,348,980, February 19, 2002.

**Jonathan J. Hull**

- [13]. M. Peairs, J.J. Hull, J. Cullen, and K. Suzuki, "Automatic archiving of documents during their transfer between a peripheral device and a processing device," United States Patent 6,199,073, March 6, 2001.
- [14]. J.J. Hull, "Matching CCITT-compressed document images," United States Patent 6,104,834, August 15, 2000.
- [15]. M. Peairs, J.J. Hull, and K. Suzuki, "Calendar incorporating document retrieval interface," United States Patent 6,085,205, July 4, 2000.
- [16]. J. Cullen, M. Peairs, and J.J. Hull, "System for aligning document images when scanned in duplex mode," United States Patent 6,067,385, May 23, 2000.
- [17]. T. Kanoh and J.J. Hull, "Content-based filing and retrieval system for name cards and hankos," United States Patent 6,061,478, May 9, 2000.
- [18]. K. Suzuki, M. A. Baxter, and J. J. Hull, "Automatic capture and processing of facsimile transmissions," United States Patent 6,021,186, Feb. 1, 2000.
- [19]. J.F. Cullen and J.J. Hull, "Navigation system for document image database," United States Patent 5,995,978, Nov. 30, 1999.
- [20]. J.J. Hull, M. Peairs, J. Cullen, M. Baxter, "Automatic and transparent document archiving," United States Patent 5,978,477, Nov. 2, 1999.
- [21]. J. Cullen, J.J. Hull, and P. Hart, "Image database browsing and query using texture analysis," United States Patent 5,933,823, August 3, 1999.
- [22]. J.J. Hull, "Document categorization by word length distribution analysis," United States Patent 5,909,680, June 1, 1999.
- [23]. M. Peairs and J.J. Hull, "High-speed retrieval by example," United States Patent 5,867,597, Feb. 2, 1999.
- [24]. J.J. Hull, "Image registration using projection histogram matching," United States Patent 5,832,110, Nov. 3, 1998.
- [25]. J.J. Hull and J.F. Cullen, "Wireless image transfer from a digital still video camera to a networked computer," United States Patent 5,806,005, Sept. 8, 1998.
- [26]. T. Hong and J.J. Hull, "OCR method and apparatus using image equivalents," United States Patent 5,764,799, June 9, 1998.
- [27]. T. Hong and J.J. Hull, "Relaxation word recognizer," United States Patent 5,617,488, April 1, 1997.
- [28]. J.J. Hull and P.E. Hart, "Image matching and retrieval by multi-access redundant hashing," United States Patent 5,465,353, November 7, 1995.
- [29]. C.C. Kuan, J.J. Hull, and S.N. Srihari, "Method and apparatus for handwritten character recognition," United States Patent 5,058,182, October 15, 1991.
- [30]. S.N. Srihari and J.J. Hull, "System to achieve automatic recognition of linguistic strings," United States Patent 4,654,875, March 31, 1987.

**conference papers**

- [1]. B. Erol, J. Graham, J. J. Hull, and D. S. Lee, "Prescient Paper: Multimedia Document Creation with Document Image Matching," IEEE International Conference on Pattern Recognition,

- Cambridge, U.K., Aug. 23-26, 2004.
- [2]. D. S. Lee, J. J. Hull, B. Erol, and J. Graham, "Minute Aid: Multimedia Note Taking in an Intelligent Meeting Room," International Conference on Multimedia and Expo (ICME), Taipei, Taiwan, June 27-30, 2004.
  - [3]. B. Erol, D. S. Lee, and J. J. Hull, "Retrieval of presentation recordings with digital camera images," IEEE Conference on Computer Vision and Pattern Recognition, Washington, D.C., June 27 - July 2, 2004.
  - [4]. B. Erol and J. J. Hull, "Linking presentation documents using image analysis," Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, Nov. 9-12, 2003.
  - [5]. B. Erol, J. J. Hull, and D. S. Lee, "Linking multimedia presentations with their symbolic source documents: algorithm and applications," ACM Multimedia 2003, Berkeley, CA, Nov. 2-8, 2003.
  - [6]. J. Graham, B. Erol, J. J. Hull, and D. S. Lee, "The video paper multimedia analysis system," ACM Multimedia 2003, Berkeley, CA, Nov. 2-8, 2003.
  - [7]. D. S. Lee, B. Erol, and J. J. Hull, "A Bayesian framework for Gaussian mixture modeling," IEEE International Conference on Image Processing, Barcelona, Spain, September 14-17, 2003.
  - [8]. J. J. Hull, B. Erol, J. Graham, and D. S. Lee, "Visualizing multimedia content on paper documents: components of key frame selection for Video Paper," IEEE International Conference on Document Analysis and Recognition, Edinburgh, Scotland, August 3-6, 2003.
  - [9]. J. Graham and J. J. Hull, "A paper-based interface for video browsing and retrieval," International Conference on Multimedia and Expo, Baltimore, MD, July 6-9, 2003.
  - [10]. B. Erol, J. J. Hull, and D. S. Lee, "Multimodal summarization of meeting recordings," International Conference on Multimedia and Expo, Baltimore, MD, July 6-9, 2003.
  - [11]. D.S. Lee, B. Erol, J. Graham, J.J. Hull, and N. Murata, "Portable meeting recorder," ACM Multimedia 2002, Juan des les Pines, France, December 1-6, 2002, 493-502.
  - [12]. D.S. Lee, B. Erol, and J. J. Hull, "Segmenting people in meeting videos using mixture background and object models," IEEE Pacific Rim Conference on Multimedia, Hsinchu, Taiwan, December 16-18, 2002.
  - [13]. J. Graham and J. J. Hull, "Video Paper: A paper-based interface for skimming and watching video," International Conference on Consumer Electronics, Los Angeles, June 18-20, 2002, 214-215.
  - [14]. J.J. Hull and D.S. Lee, "Simultaneous highlighting of paper and electronic documents," Proceedings of the International Conference on Pattern Recognition, Barcelona, Spain, September 3-7, 2000, 401-404.
  - [15]. D.S. Lee and J.J. Hull, "Duplicate detection in symbolically compressed documents," Proceedings of the Fifth International Conference on Document Analysis and Recognition, Bangalore, India, September 20-22, 1999.
  - [16]. J.J. Hull, D.S. Lee, J. Cullen, and P.E. Hart, "Document analysis techniques for the infinite memory multifunction machine," International Workshop on Document Analysis and Understanding for Document Databases, Florence, Italy, September 1-2, 1999.
  - [17]. D.S. Lee and J.J. Hull, "Information Extraction from Symbolically Compressed Document Images," Symposium on Document Image Understanding Technology, Annapolis, MD, April 14-16, 1999, 176-182.

**Jonathan J. Hull**

- [18]. J.J. Hull and P. Hart, "The Infinite Memory Multifunction Machine," Proceedings the the Third IAPR Symposium on Document Analysis Systems, Nagano, Japan, Nov. 4-6, 1998, 49-58.
- [19]. D.S. Lee and J.J. Hull, "Group 4 Compressed Document Matching," Proceedings the the Third IAPR Symposium on Document Analysis Systems, Nagano, Japan, Nov. 4-6, 1998, 29-38.
- [20]. J.J. Hull and J. Cullen, "Document image similarity and equivalence detection," Fourth International Conference on Document Analysis and Recognition, Ulm, Germany, August 19-21, 1997, 308-312.
- [21]. J. Cullen, J.J. Hull, and P.E. Hart, "Document image database retrieval and browsing using texture analysis," Fourth International Conference on Document Analysis and Recognition," Ulm, Germany, August 19-21, 1997, 718-721.
- [22]. J.J. Hull, J. Cullen, and M. Peairs, "Document image matching and retrieval techniques," Proceedings of the 1997 Symposium on Document Image Understanding Technologies, Annapolis, Maryland, April 30 - May 2, 1997, 31-35.
- [23]. J.J. Hull, "Document matching on CCITT group 4 compressed images," SPIE Conference on Document Recognition IV, San Jose, CA, February 8-14, 1997.
- [24]. J. Cullen and J.J. Hull, "A system for copying oversize documents," IAPR Workshop on Document Analysis Systems, Malvern, Pennsylvania, October 14-16, 1996.
- [25]. T. Hong and J.J. Hull, "Algorithms for postprocessing OCR results with visual inter-word constraints," International Conference on Image Processing, Washington, D.C., October 23-25, 1995.
- [26]. T. Hong, S.W. Lam, J.J. Hull, and S.N. Srihari, "The design of a nearest neighbor classifier and its use for Japanese character recognition, Third International Conference on Document Analysis and Recognition (ICDAR), Montreal, Canada, August 14-16, 1995, 270-273.
- [27]. C. Fang and J.J. Hull, "A hypothesis testing approach to word recognition using an A\* search algorithm," Third International Conference on Document Analysis and Recognition (ICDAR), Montreal, Canada, August 14-16, 1995, 360-363.
- [28]. T. Hong and J.J. Hull, "Visual inter-word relations and their use in OCR postprocessing," Third International Conference on Document Analysis and Recognition (ICDAR), Montreal, Canada, August 14-16, 1995, 442-445.
- [29]. T. Hong and J.J. Hull, "Improving OCR performance with word image equivalence," Fourth Symposium on Document Analysis and Information Retrieval, University of Nevada at Las Vegas, Las Vegas, Nevada, April 24-26, 1995, 177-190.
- [30]. C. Fang and J.J. Hull, "A word-level deciphering algorithm for degraded document recognition," Fourth Symposium on Document Analysis and Information Retrieval, University of Nevada at Las Vegas, Las Vegas, Nevada, April 24-26, 1995, 191-202.
- [31]. T. Hong and J.J. Hull, "Character segmentation using visual inter-word constraints in a text page," Proceedings of the SPIE Conference on Document Recognition II, San Jose, California, February 6-7, 1995, 15-25.
- [32]. C. Fang and J.J. Hull, "Modified character-level deciphering algorithm for OCR in degraded documents," Proceedings of the SPIE Conference on Document Recognition II, San Jose, California, February 6-7, 1995, 76-83.
- [33]. T. Hong, S.W. Lam, J.J. Hull, S.N. Srihari, "Visual similarity analysis of Chinese characters and its use in Japanese OCR," Proceedings of the SPIE Conference on Document Recognition

**Jonathan J. Hull**

- II, San Jose, California, February 6-7, 1995, 245-255.
- [34]. J.J. Hull, "Content-based document image retrieval using multiple distortion-invariant descriptors," Symposium on Document Analysis Systems (DAS-94), Kaiserslautern, Germany, October, 1994.
- [35]. T. Hong and J.J. Hull, "Degraded text recognition using word collocation and visual inter-word constraints," Conference on Applied Natural Language Processing, Stuttgart, Germany, October, 1994.
- [36]. J. Zhu and J.J. Hull, "Image-based word recognition in ideographic language documents," The 12th International Conference on Pattern Recognition, Jerusalem, Israel, October 9-13, 1994.
- [37]. S.N. Srihari, S. Lam, J.J. Hull, R.K. Srihari, and V. Govindaraju, "Intelligent data retrieval from raster images of documents," Digital Libraries '94, The First Annual Conference on the Theory and Practice of Digital Libraries, College Station, Texas, June 19-21, 1994, 34-40.
- [38]. P.B. Cullen, R.S. Curtis, P.D. Filipinski, J.J. Hull, and S.N. Srihari, "Machine print address interpretation utilizing contextual knowledge," Proceedings of the Institution of Mechanical Engineers Mail Systems 2000 International Conference, London, England, May 10-11, 1994, 97-105.
- [39]. P. Filipinski and J.J. Hull, "Keyword selection from word recognition results using definitional overlap," Third Symposium on Document Analysis and Information Retrieval, Las Vegas, Nevada, April 11-13, 1994.
- [40]. S. Khoubyari and J.J. Hull, "Font identification using visual global context," SPIE Symposium on Electronic Imaging Science and Technology, San Jose, California, February 6-10, 1994.
- [41]. T. Hong and J.J. Hull, "Degraded text recognition using word collocation," SPIE Symposium on Electronic Imaging Science and Technology, San Jose, California, February 6-10, 1994, 334-341.
- [42]. J.J. Hull and Y. Li, "Interpreting Word Recognition Decisions with a Document Database Graph," International Conference on Document Analysis and Recognition, Tsukuba, Japan, October 20-22, 1993.
- [43]. T. Hong and J.J. Hull, "Text recognition enhancement with a probabilistic lattice chart parser," International Conference on Document Analysis and Recognition, Tsukuba, Japan, October 20-22, 1993, 222-225.
- [44]. J.J. Hull and Y. Li, "Interpreting Word Recognition Decisions with a Document Database Graph," 22nd Annual Workshop on Applied Imagery Pattern Recognition, Washington, D.C., October 13-15, 1993, 488-492.
- [45]. J.J. Hull, "Language-level Syntactic and Semantic Constraints Applied to Word Recognition," Proceedings of the NATO Advanced Study Institute on Fundamentals in Handwriting Recognition, Chateau de Bonas, France, June 21-July 3, 1993, 179-202.
- [46]. R.K. Fenrich and J.J. Hull, "Concerns in Creation of Image Databases," Proceedings of IWFHR3, Third International Workshop on Frontiers in Handwriting Recognition, Buffalo, New York, May 25-27, 1993, 112-121.
- [47]. J.J. Hull and Y. Li, "Word recognition decision selection using the vector space model for information retrieval," Second Annual Symposium on Document Analysis and Information Retrieval, Las Vegas, Nevada, April 26-28, 1993.

**Jonathan J. Hull**

- [48]. S. Khoubyari and J.J. Hull, "Keyword location in noisy document images," Second Annual Symposium on Document Analysis and Information Retrieval, Las Vegas, Nevada, April 26-28, 1993.
- [49]. J.J. Hull, V. Demjanenko, R. Sridhar, and S.N. Srihari, "Architectural Design of an Address Interpretation Unit in a Laboratory Address Recognition Unit," Proceedings of the USPS Advanced Technology Conference, Washington, D.C., November 30 - December 2, 1992, 1313-1323.
- [50]. P.B. Cullen, J.J. Hull, S.N. Srihari, "A constraint-based approach to postal address interpretation," Proceedings of the USPS Advanced Technology Conference, Washington, D.C., November 30 - December 2, 1992, 367-377.
- [51]. P. Filipski, J.J. Hull, S.N. Srihari, "Compression for fast read-only access of a large database," Proceedings of the USPS Advanced Technology Conference, Washington, D.C., November 30 - December 2, 1992, 795-807.
- [52]. J.J. Hull, "Combining Syntactic Knowledge and Visual Text Recognition: A Hidden Markov Model for Part of Speech Tagging In a Word Recognition Algorithm," AAAI Fall Symposium Series, Cambridge, Massachusetts, October 23-25, 1992.
- [53]. J.J. Hull, "A hidden Markov model for language syntax in text recognition," 11th International Conference on Pattern Recognition, The Hague, The Netherlands, August 30 - September 3, 1992, 124-127.
- [54]. J.J. Hull, S. Khoubyari, and T.K. Ho, "Word Image Matching as a Technique for Degraded Text Recognition," 11th International Conference on Pattern Recognition, The Hague, The Netherlands, August 30 - September 3, 1992, 665-668.
- [55]. T.K. Ho, J.J. Hull, S.N. Srihari, "On multiple classifier systems for pattern recognition," 11th International Conference on Pattern Recognition, The Hague, The Netherlands, August 30 - September 3, 1992, 84-87.
- [56]. L. Li, T.K. Ho, J.J. Hull, S.N. Srihari, "A hypothesis testing approach to word recognition using dynamic feature selection," 11th International Conference on Pattern Recognition, The Hague, The Netherlands, August 30 - September 3, 1992, 586-589.
- [57]. J.J. Hull and A.T. Chin, "Structural semantic information utilization in visual word recognition," IAPR Workshop on Structural and Syntactic Pattern Recognition, Bern, Switzerland, August 26-28, 1992.
- [58]. J.J. Hull, S. Khoubyari, and T.K. Ho, "Visual Global Context: Word Image Matching in a Methodology for Degraded Text Recognition," Symposium on Document Analysis and Information Retrieval, University of Nevada at Las Vegas, March 16-18, 1992, 26-39.
- [59]. J.J. Hull, "Incorporation of a Markov Model of Language Syntax in a Text Recognition Algorithm," Symposium on Document Analysis and Information Retrieval, University of Nevada at Las Vegas, March 16-18, 1992, 174-185.
- [60]. P.B. Cullen, J.J. Hull, S.N. Srihari, "A Constraint Satisfaction Approach to the Resolution of Uncertainty in Image Interpretation," Proceedings of the Eighth Conference on Artificial Intelligence Applications, March 2-6, 1992, Monterey, California, 127-133.
- [61]. P.B. Cullen, T.K. Ho, J.J. Hull, M. Prussak, S.N. Srihari, "Contextual Analysis of machine-printed addresses," 1992 SPIE/IS&T Symposium on Electronic Imaging: Science and Technology, San Jose, California, February 11, 1992.

**Jonathan J. Hull**

- [62]. T.K. Ho, J.J. Hull, and S.N. Srihari, "A regression approach to combination of decisions by multiple character recognition algorithms," 1992 SPIE/IS&T Symposium on Electronic Imaging: Science and Technology, San Jose, California, February 11, 1992.
- [63]. Yong-Shul Shin, R. Sridhar, V. Demjanenko, P.W. Palumbo, J.J. Hull, "Contrast enhancement of mail piece images," 1992 SPIE/IS&T Symposium on Electronic Imaging: Science and Technology, San Jose, California, February 11, 1992, 27-37.
- [64]. J.J. Hull, T.K. Ho, J. Favata, V. Govindaraju, S.N. Srihari, "A comprehensive approach to unconstrained handwritten word recognition," Second International Workshop on Frontiers in Handwriting Recognition, Bonas, France, September 23-27, 1991, (invited to appear).
- [65]. E. Cohen, J.J. Hull, S.N. Srihari, "Understanding spatially structured handwritten text," *First International Conference on Document Analysis and Recognition*, Saint-Malo, France, September 30-October 2, 1991, 984-992.
- [66]. C. Crouner and J.J. Hull, "A hierarchical pattern matching parser and its application to word shape recognition," *First International Conference on Document Analysis and Recognition*, Saint-Malo, France, September 30-October 2, 1991, 323-331.
- [67]. Tin Kam Ho, J.J. Hull, and S.N. Srihari, "Word recognition with multi-level contextual knowledge," *First International Conference on Document Analysis and Recognition*, Saint-Malo, France, September 30-October 2, 1991.
- [68]. Alan Commike and J.J. Hull, "Syntactic pattern classification by branch and bound search," *IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, Maui, Hawaii, June, 1991.
- [69]. M. Prussak and J.J. Hull, "A Multi-level Pattern Matching Method for Text Image Parsing," *IEEE Conference on Artificial Intelligence Applications*, Miami Beach, Florida, February 24-28, 1991, pp. 183-189.
- [70]. T.K. Ho, J.J. Hull, and S.N. Srihari, "A word shape analysis approach to recognition of degraded word images," Proceedings of the USPS Advanced Technology Conference, Washington, D.C., November 5-7, 1990, 217-231.
- [71]. A.Y. Commike, and J.J. Hull, Rule learning for syntactic pattern recognition," Proceedings of the USPS Advanced Technology Conference, Washington, D.C., November 5-7, 1990, 621-633.
- [72]. P.B. Cullen, T.K. Ho, J.J. Hull, and S.N. Srihari, "Contextual analysis of machine printed addresses," Proceedings of the USPS Advanced Technology Conference, Washington, D.C., November 5-7, 1990, 779-793.
- [73]. E. Cohen, J.J. Hull, and S.N. Srihari, "Reading and understanding handwritten addresses," Proceedings of the USPS Advanced Technology Conference, Washington, D.C., November 5-7, 1990, 821-836.
- [74]. D. Sher and J.J. Hull, "On the insignificance of prior probabilities," *International Conference on Pattern Recognition*, Atlantic City, New Jersey, June 17-21, 1990, pp. 662-664.
- [75]. T.K. Ho, J.J. Hull, and S.N. Srihari, "Combination of structural classifiers," IAPR Workshop on Syntactic and Structural Pattern Recognition, Murray Hill, New Jersey, June 13-15, 1990, pp. 123-136.
- [76]. J.J. Hull, A. Commike, T.K. Ho, "Multiple algorithms for handwritten character recognition," *International Workshop on Frontiers in Handwriting Recognition*, Montreal, Canada, April 2-3, 1990, pp. 117-130. Invited to Appear.

**Jonathan J. Hull**

- [77]. J.J. Hull, "Feature extraction and language syntax in text recognition," *COST13 Workshop on Pixels to Features*, Bonas, France, August, 1988. Invited to Appear.
- [78]. J.J. Hull, S.N. Srihari, E. Cohen, L. Kuan, P. Cullen, and P. Palumbo, "A Blackboard-based approach to handwritten ZIP Code recognition," *International Conference on Pattern Recognition*, Rome, Italy, November, 1988, pp. 111-113.
- [79]. T. Pawlicki, D.S. Lee, J.J. Hull, and S.N. Srihari, "Neural network models for handwritten digit recognition," *IEEE Annual International Conference on Neural Networks*, San Diego, California, July 24-27, 1988.
- [80]. J.J. Hull, S.N. Srihari, E. Cohen, L. Kuan, P. Cullen, and P. Palumbo, "A Blackboard-based approach to handwritten ZIP Code recognition," *Proceedings of the USPS Advanced Technology Conference*, Washington, D.C., May 3-5, 1988.
- [81]. T. Pawlicki, D.S. Lee, J.J. Hull, and S.N. Srihari, "Neural network approaches to handwritten digit recognition," *Proceedings of the USPS Advanced Technology Conference*, Washington, D.C., May 3-5, 1988.
- [82]. J.J. Hull and S.N. Srihari. "Knowledge utilization in handwritten ZIP Code recognition," *Tenth International Joint Conference on Artificial Intelligence*, Milan, Italy, August 23-28, 1987.
- [83]. J.J. Hull, "Hypothesis testing in a computational theory of visual word recognition," *Sixth National Conference on Artificial Intelligence*, Seattle, Washington, July 13-17, 1987, 718-722.
- [84]. J.J. Hull, "A Computational Model for Human and Machine Reading," *Proceedings of the SPSE's 40th Annual Symposium on Hybrid Imaging Systems*, Rochester, New York, May 20-21, 1987, pp. 37-40. Invited to appear.
- [85]. J.J. Hull, "A computational theory and algorithm for fluent reading," *Third IEEE Conference on Artificial Intelligence Applications*, Kissimmee, Florida, February 23-27, 1987, pp. 176-181.
- [86]. J.J. Hull, "The use of global context in text recognition," *8th International Conference on Pattern Recognition*, Paris, France, October 28-31, 1986.
- [87]. J.J. Hull and S.N. Srihari, "Use of External Information in Zip Code Recognition," *Proceedings of the USPS Advanced Technology Conference*, Washington, D.C., October 21-23, 1986, pp. 361-370.
- [88]. S.N. Srihari, J.J. Hull, P.W. Palumbo, and C.H. Wang, "Address Block Location: Specialized Tools and Problem Solving Architecture," *Proceedings of the USPS Advanced Technology Conference*, Washington, D.C., October 21-23, 1986, pp. 116-131.
- [89]. J.J. Hull and S.N. Srihari, "A computational approach to visual word recognition: hypothesis generation and testing," *IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, Miami Beach, Florida, June, 1986, pp. 156-161.
- [90]. J.J. Hull, "Inter-word constraints in visual word recognition," *Proceedings of the Conference of the Canadian Society for Computational Studies of Intelligence*, Montreal, Canada, May 21-23, 1986, 134-138.
- [91]. J.J. Hull, "Word shape analysis in a knowledge-based system for reading text," *The Second IEEE Conference on Artificial Intelligence Applications*, Miami Beach, Florida, December 11-13, 1985, 114-119.
- [92]. S.N. Srihari and J.J. Hull, "Knowledge integration in text recognition," *Proceedings of the National Conference on Artificial Intelligence*, Pittsburgh, PA, August 1982, pp. 148-151.

**Jonathan J. Hull**

- [93]. S.N. Srihari, J.J. Hull and R. Choudhari, "Integrating diverse knowledge sources in text recognition," *Proceedings Supplement, ACM SIGOA Conference on Office Information Systems*, Philadelphia, PA, June 1982, pp. 46-54 and pp. 109-109.
- [94]. J.J. Hull and S.N. Srihari, "Comparison of two contextual post-processing algorithms for text recognition," *Proceedings of the IEEE PRIP Conference*, Las Vegas, Nevada, June 1982, pp. 146-151.
- [95]. S.N. Srihari, J.J. Hull and R. Choudhari, "Integration of bottom-up and top-down contextual knowledge in text error correction," *Proceedings of the AFIPS National Computer Conference*, Houston, Texas, June 1982, pp. 501-508.

**technical reports**

- (1) J. Geist, R.A. Wilkinson, S. Janet, P.J. Grother, B. Hammond, N.W. Larsen, R.M. Klear, M.J. Matsko, C.J.C. Burges, R. Creecy, J.J. Hull, T.P. Vogel, C.L. Wilson, "The Second Census Optical Character Recognition Systems Conference," NISTIR 5452, National Institute of Standards and Technology, Gaithersburg, Maryland, May, 1994.
- (2) R. Allen Wilkinson, Jon Geist, Stanley Janet, Patrick J. Grother, Christopher J. C. Burges, Robert Creecy, Robert Hammond, Jonathan J. Hull, Norman J. Larsen, Thomas P. Vogl, Charles L. Wilson, "The first census optical character recognition systems conference," NISTIR 4912, National Institute of Standards and Technology, Gaithersburg, Maryland, August, 1992.
- (3) J.J. Hull, "A computational theory of visual word recognition," Technical Report 88-07, Department of Computer Science, State University of New York at Buffalo, April, 1988.
- (4) J.J. Hull, D.S. Lee, and S.N. Srihari, "Characteristics of handwritten mail addresses," Technical Report 88-06, Department of Computer Science, State University of New York at Buffalo, March, 1988.
- (5) S.N. Srihari, J.J. Hull, P.W. Palumbo, C.H. Wang, "Automatic Address Block Location: Analysis of Images and Statistical Data," Technical Report 86-11, Department of Computer Science, State University of New York at Buffalo, April, 1986.
- (6) J. Geller and J.J. Hull, "Open house 1986: Current research by graduate students of the computer science department, SUNY-Buffalo," Technical Report 86-08, Department of Computer Science, State University of New York at Buffalo, March, 1986.
- (7) J.J. Hull, G. Krishnan, P. Palumbo, and S.N. Srihari, "Optical character recognition techniques in mail sorting: a review of algorithms," Technical Report 214, Department of Computer Science, State University of New York at Buffalo, June, 1984.
- (8) S.N. Srihari, J.J. Hull, P.W. Palumbo, and D. Niyogi, "Address recognition techniques in mail sorting: Research directions," Technical Report 85-09, Department of Computer Science, State University of New York at Buffalo, August, 1985.