# STEPHEN ANDREW ZAHORIAN

**NAME**: Stephen A. Zahorian
**ACADEMIC RANK**: Professor of Electrical and Computer Engineering

**DEGREES:**

Doctor of Philosophy (Electrical Engineering), Syracuse University-
Syracuse, New York, August, 1978
Master of Science (Electrical Engineering), Syracuse University-
Syracuse, New York, May, 1973
Bachelor of Science, (Electrical Engineering), University of Rochester-
Rochester, New York, May, 1969

**STATES WITHIN WHICH REGISTERED:**

Registered Professional Engineer in Virginia, 013737

**DATE OF INITIAL APPOINTMENT AT OLD DOMINION UNIVERSITY:**

Original Appointment, Assistant Professor, 1979

**PROFESSIONAL CHRONOLOGY:**

Department of Electrical and Computer Engineering, Old Dominion University, Norfolk, Virginia
Chairman, 1996-Present
Professor, 1994-1996
Associate Professor, 1984-1994
Assistant Professor, 1979-1984
Electrical and Computer Engineering, Syracuse University, Syracuse, New York
Instructor and Research Engineer, August 1977 - May 1979
Dissertation Research, "Low Redundancy Encoding of Speech Spectra", 1976-1978
Teaching Assistant, 1973-1975
Research Assistant, Voice Quality and Tactile Vocoder Projects, 1971-1975
RCA Corporation
Engineer, 1969-1971

**CONSULTING/PART TIME EMPLOYMENT:**

**SCIENTIFIC AND PROFESSIONAL SOCIETIES MEMBERSHIP:**

Institute of Electrical and Electronic Engineers (Member), 1976 - present
Acoustical Society of America (Associate Member), 1976 - present
Tau Beta Pi (Member), 1968 - present

**HONORS AND AWARDS:**

Most outstanding professor award (1990). Selected by outstanding student in Electrical and Computer Engineering.

Outstanding Instructor Award (1980). Awarded by the electrical engineering students.

**COURSES TAUGHT DURING LAST FIVE YEARS**

*Semester II, 2004-2005*
ENGN 401 – Fundamentals-Engineering Review
*Semester I, 2004-2005*
ENGN 401 – Fundamentals-Engineering Review
ECE 780/880 – Machine Pattern Analysis
*Semester II, 2003-2004*
ENGN 401 – Fundamentals-Engineering Review
*Semester I, 2003-2004*
ENGN 401 – Fundamentals-Engineering Review
ECE 481/581 – Digital Signal Processing I
*Semester II, 2002-2003*
ENGN 401 – Fundamentals-Engineering Review
ECE 782/882 – Digital Signal Processing II
*Semester I, 2002-2003*
ENGN 401 – Fundamentals-Engineering Review
*Semester II, 2001-02*
ENGN 401 – Fundamentals-Engineering Review
ECE 781/881 – Statistical Pattern Recognition
*Semester I, 2001-02*
ENGN 401 – Fundamentals-Engineering Review
ECE 487 – EE Design III
*Semester II, 2000-01*
ENGN 401 – Fundamentals-Engineering Review
ECE 481/581 – Digital Signal Processing I
ECE 487 – EE Design III
*Semester I, 2000-01*
EENGN 401 – Fundamentals-Engineering Review

**MAJOR SERVICE ACTIVITIES**

National

Proposal reviewer for SCEE (Southeastern region of electrical engineering departments) 2003-present
Panel reviewer for NSF in Bioengineering, January, 2003
Panel reviewer for NSF in Bioengineering, December 2001
Panel reviewer for NSF in Bioengineering, March 1-2, 2000

**MAJOR SERVICE ACTIVITIES**
**(continued)**

Co-organizer of NSF Workshop on Spoken Language Understanding, February, 1992.
Panel member to review NSF SBIR proposals in the area of human/machine communication, September, 1991.

Reviewer for NSF unsolicited proposals.
Reviewer of manuscripts submitted for publication in Journal of Acoustical Society of America and IEEE Transactions on Acoustics, Speech and Signal Processing.

Regional Activities

Chair, Virginia Microelectronic Educational Consortium (VMEC), 2001-2003
Chair, Southeastern Region Electrical Engineering Department Heads Association, 2002
Chair, Virginia Microelectronics Summer Scholars program, 2001-present

University Committees and Activities

Organizer of ODU Engineering Open House Contests, 2003-2005
Organizer of Computer Engineering Summer Camp, 2003
Organizer of Engineering Lab Tours and Contests for Gifted and Talented Program students from Chesapeake, 2001, 2002, 2005
Member, Search Committee for Graduate Dean, 2003
Chair, CSEMS scholarship committee, 2000-present
Chair, Department of Electrical and Computer Engineering, 1996-present
IEEE Faculty Advisor, 1991-1996
Tau Beta Pi Faculty Advisor 1980-1983

**PATENTS, LICENSES, OR COPYRIGHTS**

A Passive Fetal Heart Rate Monitoring Apparatus and Method with Enhanced Fetal Heart Beat Discrimination, patent #5,524,631.

**GRANTS AND CONTRACTS AWARDED**

"Computer based speech training for the hearing impaired," National Science Foundation, PI, S. A. Zahorian, $50,000., Project # 392811 continuation, September 15, 2003--February 28, 2004.

"Scholarship Program for Computer Science, Engineering and Mathematics Students," National Science Foundation, PI, S. A. Zahorian, Co_PIs Larry Wilson, Richard Norton, Sept. 1, 2002 – Aug. 31, 2006, $400,000.

"Speech to Text for Digital Library Development "-- JTASC under VMASC agreement, PI, Kevin McClesky, $200,000, Co-PI, S. A. Zahorian, October 1, 2000—September 30, 2005

**GRANTS AND CONTRACTS AWARDED**
**(continued)**

"A Planning Grant for Simulation and Visualization Enhanced Engineering Education," National Science Foundation, PI, Sushil Chaturvedi, Co-PI, S. A. Zahorian, September 1, 2003 – August 30, 2004, $100,000.

"Acquisition of Collaborative High Performance Computing and Visualization Cluster," National Science Foundation under the Major Research Infrastructure program, PI, S. A. Zahorian, Co-PI, Bowen Loftin, Aug. 1, 2002 – July 31, 2004, $306,000.

"Automatic Speech Recognition for Use with Aviation Weather Information (AWIN)," NASA, PI, S. A. Zahorian, CoPI, (GSRP for Penny Hix), July 1, 2000 through June 30, 2005, $110,000.

"Graduate Fellowships in Electrical Engineering" US Department of Education, GAANN program, PI, S. Zahorian, CoPI, Amin Dharamsi., Mar 1, 2000,-- Aug 14, 2004, Project # 301381, $380,750.

"Computer Science, Engineering, and Mathematics Scholarships Program (CSEMS)", National Science Foundation, $220,000, PI Stephen Zahorian, Co-Pis-- David Keyes, Bill Stanley, Irv Levenstein, David Lasseigne, Project #300861, March 1, 2000 through Feb 28, 2004.

"Computer based speech training for the hearing impaired," National Science Foundation, PI, S. A. Zahorian $261,000., NSF Project # 392811, September 15, 1999 through September 14, 2003.

"Learning by Doing: The use of the Personal Computer in Instrumentation," National Science Foundation, CCLI division, P.I., Glenn Gerdin, Co-PI, S. A. Zahorian, $60,000, Aug. 1, 1999 to July 31, 2000.

"Signal Processing and Software Enhancements for the Acoustic Fetal Heart Rate Monitor," NASA, S. A. Zahorian, PI, $15,000 awarded, 12-1-98, 9-15-99.Grant number 191331.

"Speech Database Development," Syracuse Language Systems, $10,000, S. A. Zahorian, PI, Aug. 1, 1998 to September 30, 1999.

"A Common Characterization and Industrial Design of the Fetal Heart Rate Monitor", NASA-Langley Research Center, P.I., S. A. Zahorian, January 1, 1998 – December 31, 1998, $15,000.

"A Commercialization and Industrial Design of the Fetal Heart Rate Monitor", NASA, PI, S. A. Zahorian, $39,000, February 15, 1997 – August 31, 1998.

**GRANTS AND CONTRACTS AWARDED**
**(continued)**

"Binary-Pair Partitioned Neural Networks for Speaker and Dialect Recognition," National

Science Foundation, S. A. Zahorian, PI, $2,880, December 1, 1995 - July 31, 1995.

"Visual Speech Articulation Training Aid," National Science Foundation, S. A. Zahorian, PI, $178,006, July 1, 1994 - June 30, 1997 (7/21/94).

"Calibration and Field Testing of High-Temperature Fiber Optic Acoustics Sensors," NASA/IRD, S. A. Zahorian, PI, $22,131, June 1, 1994 - December 31, 1994 (5/12/94).
"Signal Processing for Prenatal Detection of Cerebral Palsy, NASA, S. A. Zahorian, PI, $30,000, Sept. 1, 1993 - Dec. 31, 1993.

"Binary-Pair Partitioned Neural Networks for Speaker and Dialect Recognition - REU Supplement," National Science Foundation, S. A. Zahorian, PI, $10,000, Aug. 31, 1993 - July 31, 1994.

"Binary-Pair Partitioned Neural Networks for Speaker and Dialect Recognition," National Science Foundation, S. A. Zahorian, PI, $259,504, Feb. 15, 1993 - July 31, 1995.

"NSF Workshop on Spoken Language Understanding," (IRI-9208831), National Science Foundation, $35,762, Feb. 1, 1992 - Jan. 31, 1993, R. Cole (PI),

"Coupling of Bottom-Up and Top-Down Knowledge Sources for Automatic Speech Recognition," National Science Foundation, $118,846, Sept 1, 1991 to Aug 31, 1993, principal investigator.

"Visual Speech Display as an Articulation Training Aid for the Deaf," National Science Foundation, $150,000, July 15, 1990 to July 14, 1993, principal investigator.

"Automatic Floor Profiler Instrumentation," Edward Face Co. and CIT-Engineering Clinic, ODURF grant # 564205/56406, $16,000, July 30, 1987 to June 30,1988, principal investigator.

"Spectral Shape Factors as Acoustic Invariants for Speech Perception, "National Science Foundation, NSF grant # ITI-87-02649, $124,000, July 15, 1987 to Dec 15, 1989, principal investigator.

"Speaker Independent Isolated Word Speech Recognition Using the Discrete Cosine Transform," $59,000, ODURF grant # 564541/764541 Texas Instruments and Virginia Center for Innovative Technology, Jan 1, 1986 to June 1, 1987, principal investigator.

## GRANTS AND CONTRACTS AWARDED
## (continued)

"Speaker Independent Isolated Word Speech Recognition Using the Discrete Cosine Transform," $17,000, ODURF grant # 764270 Texas Instruments, September 1, 1985 to December 31, 1985, principal investigator.

"Visual Speech Display for the Deaf," The Whitaker Foundation, $61,580, March 1, 1983 to February 28, 1985, principal investigator.

"Visual Speech Display for the Deaf," The Whitaker Foundation, ODURF grant #544540 $49,972, July 1, 1985 to June 30, 1985, principal investigator.

"Development of Digital Signal Processing Laboratory," Digital Equipment Corporation, $30,000 equipment grant, June 1, 1982 to May 30, 1983, principal investigator.

"Low Redundancy Encoding of Speech Spectra," NSF (Engineering Initiation Proposal), NSF grant # ECS 8106570, $47,754, June 1, 1981 to November 30, 1983, principal investigator.

"Speech Intelligibility Testing," General Electric Company, $2,933.84, principal investigator.

"Speech Parameter Extraction," ODU (Summer Faculty Research Fellowship), $2,905, June 1, 1980 to December 15, 1980, principal investigator.

"Low Redundancy Voice Encoding," Syracuse University Senate Research Committee, $7,500, July 1, 1976 to June 30, 1977, principal investigator.

## SCHOLARLY ACTIVITIES COMPLETED

### Books

### Chapters in Books

### Refereed Journal Articles

Montri Karjanadecha and Stephen Zahorian, "Signal Modeling for High-Performance Isolated Word Recognition," *IEEE Transactions on Speech and Audio Processing*, Vol. 9, No. 6, pp. 647-654, September 2001.

S. A. Zahorian, W. Swart, V. Lakdawala, J. Leathrum, O. González, "A Modular Approach to using Computer Technology for Education and Training," *International Journal of Computer Aided Manufacturing*, Vol. 13, pp. 286-297, May-June 2000.

**Refereed Journal Articles**
**(continued)**

S. A. Zahorian and Z. B. Nossair, "A Partitioned Neural Network Approach for Vowel Classification Using Smoothed Time/Frequency Features," *IEEE Transactions on Speech and Audio Processing*, Vol. 7, No. 4, pp. 414-425, July 1999.

R. Cole, L. Hirschman, L. Atlas, M. Beckman, A. Biermann, M. Bush, M. Clements, J. Cohen, O. Garcia, B. Hanson, H. Hermansky, S. Levinson, K. McKeown, N. Morgan, D. G. Novick, M. Ostendorf, S. Oviatt, P. Trice, H. Silverman, J. Spitz, A. Waibel, C. Weinstein, S. Zahorian, and V. Zue, "The Challenge of Spoken Language Systems: Research Directions for the Nineties," *IEEE Trans. on Speech and Audio Processing*, Vol. 3, pp. 1-21, January 1995.

S. A. Zahorian and A. J. Jagharghi, "Spectral-Shape Features Versus Formants as Acoustic Correlates for Vowels," *J. Acoust. Soc. Am*, Vol. 94-4, pp. 1966-1982, October 1993..

S. A. Zahorian and A. J. Jaghurghi (1992). "Minimum Mean-Square Error Transformations of Categorical Data to Target Positions," *IEEE Trans. on Signal Processing*, 40-1, pp. 13-23.

S. A. Zahorian and A. J. Jagharghi (1991). "Speaker Normalization of Static and Dynamic Vowel Spectral Features," *J. Acoust. Soc. Amer.*, 90-1, 67-75.

Z. B. Nossair and S. A. Zahorian (1991). "Dynamic Spectral Shape Features as Acoustic Correlates for Initial Stop Consonants," *J. Acoust. Soc. Amer.*, 89-6, 2978-2991.

S. A. Zahorian and M. Rothenberg (1981). "Principal-Components Analysis for Low-Redundancy Encoding of Speech Spectra," *J. Acoust. Soc. Amer.*, 69, 832-845.

M. Rothenberg, R. Verillo, S. A. Zahorian, M. Brachman and S. Bolanow-ski, Jr. (1977). "Vibrotactile Frequency for Encoding a Speech Parameter," *J. Acoust. Soc. Amer.*, 62, 1003-1012.

**Refereed National/International Proceedings**

Princy Dikshit, Stephen A. Zahorian and Shivram Nagulapati,"An Algorithm for Locating Fundamental Frequency Markers in Speech Signals," accepted for publication in *International Conference on Acoustics, Speech, and Signal Processing,* March 2005.

Wei Wang and Stephen A. Zahorian, "Vocal Tract Normalization based on Spectral Template Matching," *International Conference on Spoken Language Processing*, Oct 4-8, 2004, Paper FrB1801p.8_p1185, Korea.

**Refereed National/International Proceedings**
**(continued)**

Stephen A. Zahorian, Mame Sall, Fansheng Meng, and Wei Wang, "Generalization of Support Vector Machines versus Neural Networks for Pattern Classification*," Intelligent Engineering Systems through Artificial Neural Networks*, Volume 14, pp 639-644, Nov 7-10, 2004, St. Louis,

Mukund Devarajan, Fansheng Meng, Penny Hix, and Stephen A. Zahorian, "HMM-Neural Network Monophone Models for Computer-Based Articulation Training for the Hearing Impaired," *2003 International Conference on Multimedia and Expo*, v lll, pp. 197-200, July 2003.

Mukund Devarajan, Fansheng Meng, Penny Hix, and Stephen A. Zahorian, "HMM-Neural Network Monophone Models for Computer-Based Articulation Training for the Hearing Impaired," *International Conference on Acoustics, Speech, and Signal Processing*, vII, pp369-372, (Conference cancelled due to SARS, but proceedings published)

Stephen A. Zahorian, A. Mathew Zimmer, Fansheng Meng, "Vowel Classification for Computer-Based Visual Feedback for Speech Training for the Hearing Impaired," *International Conference on Spoken Language Processing*, 973-976, Denver, CO, September 16-20, 2002.

Kavita Kasi and Stephen A. Zahorian, "Yet Another Algorithm for Pitch Tracking," Paper #2294, l-361-364, *International Conference on Acoustics, Speech, and Signal Processing*, Orlando, FL, May 13-17, 2002.

Lakdawala, V. K., Zahorian, Stephen A., Gonzalez, Oscar R., Kumar H., Amit, and Leathrum, James F., "An Instrument for Assessing Knowledge Gain in a First Course in Circuit Theory," *Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition*, Montreal, Canada, 2002.

Stephen A. Zahorian, Vishnu Lakdawala, Oscar Gonzalez, Scott Starsman, and James F. Leathrum, "Question model for Intelligent Questioning Systems in Engineering Education, *Proceedings of the 2001 Frontiers in Education Conference*, Reno, Nevada, October 10-13, 2001

Stephen A. Zahorian, Sacharia Albin, William Swart, "Global Engineering Education: A partnership between Rajagiri College (Cochin, India), and Old Dominion University (Norfolk, VA)" *Proceedings of the 2001 ASEE meeting*, Albuquerque, NM, June 24-27, 2001.

**Refereed National/International Proceedings**
**(continued)**

Vishnu Lakdawala, Stephen A. Zahorian, "Knowledge Maps for Intelligent Questioning Systems in Engineering Education," James Leathrum, Oscar Gonzalez, *Proceedings of the 2001 ASEE meeting*, Albuquerque, NM, June 24-27, 2001.

J. Venugopal, S. A. Zahorian, and M. Karnjanadecha, "Minimum Mean Square Error Spectral Peak Envelope Estimation for Automatic Vowel Classification," *Proc. International Conference on Spoken Language Processing*, vol. 4, pp. 700-703, Beijing, China, Oct 16-20, 2000.

M. Karnjanadecha and S. A. Zahorian, "An Investigation of Variable Block Length Methods for Calculation of Spectral/Temporal Features for Automatic Speech Recognition," *Proc. International Conference on Spoken Language Processing*, vol. 4, pp. 1053-1056, Beijing, China, Oct 16-20, 2000.

S. A. Zahorian and M. A. Zimmer, "Discriminative and Maximum Likelihood Classifiers for Computer-Based Visual Feedback and Speech Training for the Hearing Impaired," *World Multiconference on Systemics, Cybernetics and Informatics (SCI 2000/ISAS 2000)*, Vol. VI, Part II, pp. 475-479, Orlando, Florida, July 2000.

S. A. Zahorian, S. Patilkulkarni, M. Karnjanadecha, and C. Brewton, "Speech-to-Text Translation for Indexing and Searching of Audio/Visual Materials for a Digital Library," *World Multiconference on Systemics, Cybernetics and Informatics (SCI 2000/ISAS 2000)*, Vol. VI, Part II, pp. 415-417, Orlando, Florida, July 2000.

William Swart, Stephen Zahorian, Vishnu Lakdawala, James Leathrum, Oscar González , "A Multi-Use Architecture for Technology-Based Delivery of Curricula, *ASEE/IEEE Frontiers in Education Conference*, Nov 10-13, 1999, San Juan, Puerto Rico, 12c2-12 – 12c2--17

Stephen A. Zahorian, "Reusable Binary-Paired Partitioned Neural Networks for Text-Independent Speaker Identification," *International Conference on Acoustics, Speech, and Signal Processing*, pp. II-849-852, March 15-59, 1999.

.

Montri Karnjanadechi and Stephen A. Zahorian, "Signal Modeling for Isolated Word Recognition," *International Conference on Acoustics, Speech, and Signal Processing*, pp. II-293-296, March 15-19, 1999.

S. A. Zahorian, A. Zimmer, and B. Dai, "Personal Computer Software Vowel Training Aid for the Hearing Impaired", *International Conference on Acoustics, Speech, and Signal Processing*, pp. VI-3625-3628, May 12-15, 1998.

**Refereed National/International Proceedings**
**(continued)**

Montri Karnjanadechi and Stephen A. Zahorian, "Robust Feature Extraction for Alphabet Recognition," *5th International Conference on Spoken Language Processing,* pp. II-337-340, November 30 – December 4, 1998.

S. A. Zahorian, P. Silsbee and X. Wang, "Phone Classification with Segmental Features and a Binary-Pair Partitioned Neural Network Classifier," *ICASSP 97*, Munich, Germany, April 21-23, 1997.

S. Albin, J. Zheng, A. Lavariag, S. A. Zahorian, "A Non-Invasive Fiber Optic Sensor for the Fetal Heart Rate Monitoring," *International Conference on Fiber Optics and Photonics*, December 9-13, 1996.

X. Wang, S. A. Zahorian, and S. Auberg, "Variable Resolution Spectral/Temporal Features for Speech Segments," *ICSLP-96*, pp. 1221-1224.

H. L. Cycon, W. Li and S. A. Zahorian, "Stop Consonant Classification Using Wavelet Packet Transforms and Neural Network," *Intelligent Engineering Systems Through Artificial Neural Networks*, Vol. 5, Fuzzy Logic and Evolutionary Programming, pp. 733-738, St. Louis, Missouri, November 1995.

C. A. Norton, III and S. A. Zahorian, "Speaker Verification Based on Speaker Position in a Multidimensional Space," *Intelligent Engineering Systems Through Artificial Neural Networks*, Vol. 5, Fuzzy Logic and Evolutionary Programming, pp. 739-744, St. Louis, Missouri, November 1995.

B. A. Hawickhorst, S. A. Zahorian, and R. Rajagopal, "A Comparison of Three Neural Network Architectures for Automatic Speech Recognition," *Intelligent Engineering Systems Through Artificial Neural Networks*, Vol. 5, Fuzzy Logic and Evolutionary Programming, pp. 221-226, St. Louis, Missouri, November 1995.

Z. B. Nossair, P. L. Silsbee, and S. A. Zahorian, "Signal Modeling Enhancements for Automatic Speech Recognition, *ICASSP-95*, Vol. I, pp. 824-827, Detroit, MI, May 1995.

S. A. Zahorian, A. Zhou, and N. Correal, "Comparison of Minimum Misclassification (MME) Networks with Least Mean Square Error (LMS) Networks," ANNIE '94 Conference, and published in *Intelligent Engineering Systems through Artificial Neural Networks*, Vol. 4, pp. 191-198, St. Louis, MO, November 1994.

**(continued)**

C. A. Norton, III, S. A. Zahorian, and Z. B. Nossair, "The Application of Binary-Pair Partitioned Neural Networks to the Speaker Verification Task," ANNIE '94 Conference, and published in *Intelligent Engineering Systems through Artificial Neural Networks*, Vol. 4, pp. 441-446, St. Louis, MO, November 1994.

S. A. Zahorian and Z. B. Nossair, "A Neural Network Clustering Technique for Text-Independent Speaker Identification," ANNIE '94 Conference, and published in *Intelligent Engineering Systems through Artificial Neural Networks*, Vol. 4, pp. 453-460, St. Louis, MO, November 1994.

P. L. Silsbee, S. A. Zahorian, and Z. B. Nossair, "A Warped Time-Frequency Expansion for Speech Signal Representation," *Proc. IEEE-SP Symposium on Time-Frequency and Time-Scale Analysis*, pp. 636-639, Philadelphia, PA, October 1994.

Z. B. Nossair and S. A. Zahorian, "Smoothed Time-Frequency Features for Vowel Classification," *Proc. IEEE-SP International Symposium on Time-Frequency and Time-Scale Analysis*, pp. 592-595, Philadelphia, Pennsylvania, October 1994.

S. A. Zahorian, Z. B. Nossair, and C. A. Norton, "A Partitioned Neural Network Approach for Vowel Classification Using Smoothed Time/Frequency Features," *Eurospeech*, Vol. 2, pp. 1225-1228, Berlin, Germany, September 1993.

S. A. Zahorian and L. Rudasi, (1993). "Speaker Identification with Partitioned Neural Networks", *Proc. IEEE DUAL-USE Technologies and Applications Conference*, pp. 189-195, Utica/Roma, New York, May 24-27, 1993.

S. A. Zahorian and L. Rudasi, (1993). "Neural Network Advances for Speaker Identification," *Secur Tech/Card Tech Conference Proceedings*, April 19, 1993, Washington, D.C., pp. 339-349.

L. Rudasi and S. A. Zahorian (1992). "Text Independent Talker Identification Using Binary-Pair Partitioned Neural Networks," *International Joint Conference on Neural Networks*, Vol. 4, pp. 679-684, Baltimore, MD, June 1992.

S. A. Zahorian, and D. L. Livingston (1992). "Neural Networks for Feature Computations in Automatic Speech Recognition," *International Joint Conference on Neural Networks*, Vol. 4, pp. 667-672, Baltimore, MD, June 1992.

**Refereed National/International Proceedings**
**(continued)**

S. A. Zahorian, S. Kelkar and D. L. Livingston (1992). "Formant Estimation from Cepstral Coefficients Using a Feedforward Memoryless Neural Network," *International Joint Conference on Neural Networks*, Vol. 4, pp. 673-678, Baltimore, MD, June 1992.

A. E. Beck and S. A. Zahorian (1992). "Transformations of Speech Spectra to a Two-Dimensional Continuous-Valued Phonetic Feature Space for Vowel Training", *ICASSP-92*, pp. 241-244, San Francisco, CA, March 1992.

L. Rudasi and S. A. Zahorian (1992). "Text Independent Talker Identification Using Binary-Pair Partitioned Neural Networks," *International Joint Conference on Neural Networks*, Vol. 4, pp. 679-684, Baltimore, MD, June 1992.

S. A. Zahorian, and D. L. Livingston (1992). "Neural Networks for Feature Computations in Automatic Speech Recognition," *International Joint Conference on Neural Networks*, Vol. 4, pp. 667-672, Baltimore, MD, June 1992.

S. A. Zahorian, S. Kelkar and D. L. Livingston (1992). "Formant Estimation from Cepstral Coefficients Using a Feedforward Memoryless Neural Network," *International Joint Conference on Neural Networks*, Vol. 4, pp. 673-678, Baltimore, MD, June 1992.

A. E. Beck and S. A. Zahorian (1992). "Transformations of Speech Spectra to a Two-Dimensional Continuous-Valued Phonetic Feature Space for Vowel Training", *ICASSP-92*, pp. 241-244, San Francisco, CA, March 1992.

S. A. Zahorian, D. Qian, and A. J. Jagharghi (1991). "Acoustic-Phonetic Transformations for Improved Speaker-Independent Isolated Word Recognition," *ICASSP-91*, 561-564.

L. Rudasi and S. A. Zahorian (1991). "Text-Independent Talker Identification with Neural Networks," *ICASSP-91*, 389-392.

S. A. Zahorian and S. Venkat (1990). "Vowel Articulation Training Aid for the Deaf," *ICASSP-90*, 1121-1124.

S. A. Zahorian and Z. B. Nossair (1990). "Dynamic Spectral Features for Speaker-Independent Automatic Recognition of Stop Consonants," *ICASSP-90*, 793-796.

S. A. Zahorian (1988). "Color Display of Vowels as a Speech Articulation Training Aid," *IEEE Engineering in Medicine & Biology Society 10th Annual International Conference*, pp 1539-1540.

**Refereed National/International Proceedings**
**(continued)**

S. A. Zahorian and P. Gordy (1983). "Finite Impulse Response (FIR) Filters for Speech Analysis and Synthesis," *ICASSP-83*, 808-811.

**Refereed Regional/Local Proceedings**

L. Rudasi and S. A. Zahorian (1991). "Pattern-Recognition Using Neural Networks with a Binary Partitioning Approach, *SOUTHEASTCON-91*.

P. J. Berlinsky and S. A. Zahorian (1986). "A Program for Plotting Experimental Data on a Personal Computer," *SOUTHEASTCON '86*, 251-254.

S. A. Zahorian, J. S. Stoughton and M. A. Do (1986). "A Laboratory for Designing Digital Systems," *SOUTHEASTCON '86* , 246-250.

**Technical Reports**

"Commercialization and Industrial Development for the Fetal Heart Rate Monitor, " Final Report submitted to NASA, January 30, 2000, ODURF #191331

"Visual Speech Articulation Training Aid," Final report submitted to the National Science Foundation, December 3, 1998.

"Commercialization and Industrial Development for the Fetal Heart Rate Monitor," Final Report submitted to NASA, November 3, 1998.

S. A. Zahorian, "Passive Acoustically Based Fetal Heart Rate Monitor," NASA TASK ASSIGNMENT #79, June 1996.

S. A. Zahorian, "Calibration and Field Testing of High Temperature Fiber Optic Acoustic Sensors," NASA TASK ASSIGNMENT #31, February 1996.

S. A. Zahorian, "Signal Processing for Prenatal Detection of Cerebral Palsy," NASA TASK ASSIGNMENT #32, December 1995.

S. A. Zahorian, "Coupling of Bottom-Up and Top-Down Knowledge Sources for Automatic Speech Recognition," NSF Final Report, Sept. 1993.

S. A. Zahorian, "Visual Speech Display as an Articulation Training Aid for the Deaf," NSF Final Report, July 1993.

**Technical Reports**
**(continued)**

S. A. Zahorian and M. Bountress (1991). "Visual Speech Display as an Articulation Training Aid for the Deaf," Rehabilitation R&D Progress Reports, Veterans Health Administration, pp. 334-335.

S. A. Zahorian (May 1991). "Coupling of Bottom-Up and Top-Down Knowledge Sources for Automatic Speech Recognition," progress report submitted to the National Science Foundation.

S. A. Zahorian (May 1991). "Visual Speech Display as an Articulation Training Aid for the Deaf," progress report NSF Grant #BCS-9010334.

S. A. Zahorian (July 1990). "Spectral Shape Factors as Acoustic Invariants for Speech Perception," final report Grant #IRI-8702649.

S. A. Zahorian (September 1986). "Visual Speech Display for the Deaf," final report for the Whitaker Foundation.

S. A. Zahorian (December 1986). "Speaker Independent Isolated Word Speech Recognition Using the Discrete Cosine Transform," progress report to Texas Instruments, Inc.

S. A. Zahorian (February 1984). "Visual Speech Display for the Deaf," progress report submitted to the Whitaker Foundation.

S. A. Zahorian (February 1984). "Research Initiation: Low Redundancy Encoding of Speech Spectra," final report submitted to NSF.

S. A. Zahorian (September 1982). "Research Initiation: Low Redundancy Encoding of Speech Spectra," progress report submitted to NSF.

S. A. Zahorian (October 1978) "Principal-Components Analysis for Low Redundancy Encoding of Speech Spectra," Syracuse University Technical Report TR-78-10.

**Presentations not Published in Proceedings (International)**

Lingyun Gu and Stephen A. Zahorian, "A New Robust Algorithm for Isolated Word Endpoint Detection," IV-4161 International Conference on Acoustics, Speech, and Signal Processing, Orlando, FL, May 13-17, 2002.

K. Kasi, L. Gu, and S. A. Zahorian, "Toolbox for fundamental frequency estimation," ICASSP 2001, Salt Lake City, UT, May 2001. (Student presentation)

**Presentations not Published in Proceedings (International)**
**(continued)**

A. M. Zimmer and S. A. Zahorian, "The integration of discriminative and maximum likelihood distance measures for a vowel articulation training aid", paper presented at the 136th Meeting of the Acoustical Society of America, Norfolk, VA, October 15, 1998, abstract appeared in *The Journal of the Acoustical Society of America*, Vol. 104, No. 3, Pt. 2, p. 1854, September 1998.

B. Dai and S. A. Zahorian, "Fundamental frequency synchronous spectral analysis for vowel classification", paper presented at the 136th Meeting of the Acoustical Society of America, Norfolk, VA, October 14, 1998, abstract appeared in *The Journal of the Acoustical Society of America*, Vol. 104, No. 3, Pt. 2, p. 1805, September 1998.

S. A. Zahorian and N. S. Correal, "Vowel Training Experiments with a Computer-Based Vowel Training System" *J. Acoust. Soc. Am.*, Vol. 95, No. 5, Pt. 2, p. 3014, May 1994.

Z. B. Nossair, Z. J. Zhang, and S. A. Zahorian, "Spectral Envelope Features for Vowel Classification in Clean and Noisy Speech," J. *Acoust. Soc. Am.*, Vol. 95, No. 5, Pt. 2, p. 2817, May 1994.

S. A. Zahorian and Z. B. Nossair, "Acoustic Segment Models for Automatic Speech Recognition," *Proc. 1993 IEEE Workshop on Automatic Speech Recognition*, pp. 22-23, Snowbird, Utah, December 1993.

S. A. Zahorian, Z. J. Zhang, and Z. B. Nossair (1993). "Spectral Shape Cues for Vowels Which Predict the Perception of Multiple-Tone Steady-State Stimuli," *J. Acoust. Soc. Amer.*, Vol. 93, 2298, 17-21 May, 1993, Ottawa, Canada.

S. A. Zahorian, Z. Zhang, and Z. Nossair (1992). "Perception of Vowels Synthesized from Sinusoids that Preserve Either Formant Frequencies or Spectral Shape," *J. Acoust. Soc. Amer.*, Vol. 92, p. 2414, Nov. 3, 1992, New Orleans, LA.

L. Rudasi and S. A. Zahorian (1990). "Text-Independent Talker Identification Using Recurrent Neural Networks," *J. Acoust. Soc. Amer*. 87, Supp. 1, S104.

A. J. Jagharghi and S. A. Zahorian (1990). "Vowel Perception: Spectral Shape Versus Formants," *J. Acoust. Soc. Amer.* 87, Supp 1, S159.

Z. B. Nossair and S. A. Zahorian (1989). "Spectral Shape Factors for Speaker-Independent Automatic Recognition of Stop Consonants," *J. Acoust. Soc. Amer.* Suppl 1 85, S136.

**Presentations not Published in Proceedings (International)**
**(continued)**

S. A. Zahorian and A. J. Jagharghi, (1989). "Linear Transformations for Vowel Normalization," *J. Acoust. Soc. Amer. Suppl 1* 85, S51.

A. J. Jagharghi and S. A. Zahorian (1987). "Vowel Identification: Are Formants Really Necessary?" *J. Acoust. Soc. Amer. Suppl 1* 81, S18.

S. A. Zahorian, Z. B. Nossair, and R. F. Coleman (1987). "Evidence Against Acoustic Invariance in Initial Voiced Stop Consonants," *J. Acoust. Soc. Amer. Suppl 1* 81, S136.

S. A. Zahorian and A. J. Jagharghi (1987). "Speaker-Independent Vowel Recognition Based on Overall Spectral Shape Versus Formants," *J. Acoust. Soc. Amer.Suppl 1* 82, S37.

S. A. Zahorian and A. J. Jagharghi (1986). "Matching of "Physical" and "Perceptual" Spaces for Vowels," *J. Acoust. Soc. Amer. Suppl 1* 79, S8.

E. A. Effer and S. A. Zahorian (1986). "An Investigation of Mixed-Source Excitation Models for Linear Predictive Vocoders," *J. Acoust. Soc. Amer. Suppl 1* 79, S26.

S. A. Zahorian and A. J. Jagharghi (1985). "Color Display of Vowel Spectra as a Speech Training Aid for the Deaf," *J. Acoust. Soc. Amer. Suppl 1* 77, S97.

J. Holland and S. A. Zahorian (1984). "Block Encoding of Speech Spectral Principal Components," *J. Acoust. Soc. Amer. Suppl 1* 75, S59.

S. A. Zahorian and J. Holland (1984). "Visual Speech Display for the Deaf," *J. Acoust. Soc. Amer. Suppl 1* 75, S32.

S. A. Zahorian, (1982). "Optimal Vector Quantization of Speech Spectral Principal Components," *J. Acoust. Soc. Amer.* 71, Supp 1, S6.

S. A. Zahorian (1980). "Orthogonal Coding of Linear Prediction Log Area Ratios," *J. Acous. Soc. Amer.*, 67, Supp 1., S12.

S. A. Zahorian and M. Rothenberg (1977). "Principal Components Analysis of Speech Spectra," *J. Acoust. Soc. Amer.* 61, Supp 1, S69.

**Presentations not Published in Proceedings (Regional/Local)**

A. J. Jagharghi and S. A. Zahorian (1988). "Visual Speech Display for the Deaf," presented at the Virginia Academy of Sciences.

**GRADUATE DEGREES SUPERVISED**

Fansheng Meng, "Combining Neural Networks and Hidden Markov Models for Computer-Based Speech Articulation Training," PhD dissertation, in progress

Penny Hix, "Automatic Speech Recognition using Pitch Synchronous Analysis followed by Peak Discrete Cosine Transform Coefficients," PhD dissertation, in progress

Mame Sall, "Generalization Issues in Pattern Classification Applied to Speaker Identification, " MS Thesis, February, 2005

Princy Dikshit, "An Algorithm for Locating Fundamental Frequency (F0) Markers in Speech," MS Thesis, December, 2004

Wei Wang, "Speaker Normalization for Improved Automatic Speech Recognition for Digital Libraries," MS Thesis, May 2004

Mukund Devarakan, "A Computer-Based Articulation Training Aid for Short Words (CATA), MS Thesis, December 2003.

Ashutosh Mishra, "Automatic Speaker Identification Using Reusable and Retrainable Binary-Pair Partitioned Neural Networks, MS Thesis, May 2003.

Kavita Kasi, "YAPT: Yet Another Pitch Tracking Algorithm," M. S. Thesis, December 2002.

Lingyun Gu , " A New Robust Algorithm for Isolated Word Endpoint Detection," M. S. Thesis, February, 2002.

Matt Zimmer, " VATA: An Improved Personal Computer-Based Vowel Articulation Training Aid, M. S. Thesis, February, 2002.

Montri Karnjanadecha, "Signal Modeling with Non-Uniform Time Sampling of Features for Automatic Speech Recognition," Ph.D. Dissertation, August 2000.

Bingjun Dai, "Variability Analysis of Discrete Cosine Transform coefficient (DCTC) Features for Speech Processing," Master's thesis, December 1998.

Xihong Wang, "Acoustic Segmentation Model for Isolated Word Recognition", MS Thesis, April 1998.

Charles Brewton, "An Enhanced Signal Processing Strategy for Fetal Heart Rate Detection," M. S. Thesis, May 1996.

**GRADUATE DEGREES SUPERVISED**
**(continued)**

Stefan Auberg, “Speech Feature Computation for Visual Speech Articulation Training,” M. S. Thesis, May 1996.

C. A. Norton, III, “Text Independent Speaker Verification Using Binary-Pair Partitioned Neural Networks,” December 1995.

Roger Zhou, "Fetal Heart Rate Detection with a Passive Acoustic Sensor System," M.S. Thesis, Spring 1995.

Neiyer Correal, "Real-Time Visual Speech Articulation Training Aid," M.S. Thesis, Fall 1994.

Zhongjiang Zhang, "Acoustic Correlates of Vowel Perception as Determined From Synthesis Experiments with Multi-Tone Stimuli," M. S. Thesis, Dec. 1993.

Laszlo Rudasi, "Text Independent Automatic Speaker Identification Using Partitioned Neural Networks," Ph.D. Dissertation, August 1992.

Shubanghi Kelkar, "Formant Estimation from DCTS's Using a Feedforward Neural Network," M.S. Thesis, May 1992.

Andrew Beck, "Neural Network Based Vowel Training Aid for the Deaf," M.S. Thesis, May 1992.

D. Qian, "Encoding Phonetic Knowledge for Use in Hidden Markov Models of Speech Recognition," Master's Thesis, June 1990.

Amir Jagharghi, "A Comparative Study of Spectral Peaks Versus Global Spectral Shape as Invariant Acoustic Cues for Vowels," Ph.D. Dissertation, August 1990.

Subhashri Venkat, "Visual Speech Training Aid for the Deaf," M.S. Thesis, August 1990.

Zaki Nossair, "Dynamic Spectral Shape Features as Acoustic Correlates for Stop Consonants," Ph.D. Dissertation, December 1989.

C. Shen, "Discrete Cosine Transform Analysis for Speaker-Independent Automatic Acoustic-Phonetic Transcription," Ph.D. Dissertation, August 1988.

A. Jagharghi, "Color Display of Vowel Spectra as a Speech Training Aid for the Deaf," M.E. Thesis, August 1985.

**GRADUATE DEGREES SUPERVISED**
**(continued)**

Elizabeth Effer, "An Investigation to Improve Linear Predictive Vocoder Pulse/Noise

Models," M.E. Thesis, December 1985.

James Holland, "Block Encoding of Speech Spectral Principal Components," Master's Thesis, August 1984.

Paul E. Gordy, "Speech Spectral Modeling and Speech Synthesis Using Finite Impulse Response Digital Filters," M.E. Thesis, December 1982.

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