Vikas Chandrakant Raykar

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OBJECTIVE To obtain a challenging research internship position.

EXPERTISE Signal Processing, Computer Audition and Vision, Machine Learning.

RESEARCH INTERESTS Distributed Sensors for Auditory and Visual Perception, Automatic Position Calibration of microphone arrays, Auditory source localization and tracking, Time delay estimation, Perceptually inspired Structural models for spatial audio perception, Distributed algorithms for sensor network localization, Nonlinear Manifold learning.

EDUCATION

Doctor of Philosophy Advisor: Dr. Ramani Duraiswami
Department of Computer Science (January 2004 to current)
University of Maryland, College Park, MD *Current GPA*: 4.0/4.0

Master of Science Advisors: Dr. Rama Chellappa and Dr. Ramani Duraiswami
Department of Electrical Engineering (December 2003)
University of Maryland, College Park, MD
Major: Signal Processing *Minor*: Computer Engineering *GPA*: 3.828/4.0

Bachelor of Engineering
Electronics and Communication Engineering (May 2001)
Regional Engineering College, Trichy, India
Department Rank:1/51 *Aggregate*: 87.97% *Equivalent GPA*: 4.0/4.0

WORK STATUS F-1 Student visa.

CITIZENSHIP India.

RESEARCH / WORK EXPERIENCE

Graduate Technical Intern 02/2003 to 08/2003
Future Platforms Lab, Intel Research Labs, Intel Corporation, Santa Clara CA
Mentors: Dr. Igor Kozintsev and Dr. Rainer Lienhart

- Designed and implemented novel algorithms for 3D position calibration of a network of microphones/cameras and speakers/displays on distributed computing platforms. The work resulted in 3 publications and filing of 2 patents.

Graduate Research Assistant 08/2001 to 02/2003 and 09/2003 to current
Perceptual Interfaces and Realities Lab., University of Maryland, CollegePark
Research Advisors: Dr. Ramani Duraiswami and Dr. B. Yegnanarayana

- Developed algorithms and error bounds for automatic microphone array position calibration.
- Developed novel methods for time delay estimation using excitation source information in speech.
- Developed a method to estimate the frequency of the spectral notches in the measured Head Related Impulse responses.

- Implemented a real time video conferencing setup using a microphone array and a pan-tilt camera which includes auditory source localization, automatic camera pointing, face detection and multi channel speech enhancement.

Undergraduate Research Fellow 11/1999 to12/1999 and 04/2000 to 05/2000
Speech and Audio laboratory, Indian Institute of Science, Bangalore, India
Advisor: Dr.T. V. Sreenivas

- Implemented a real-time 3D spatial audio system using Head Related Transfer Functions (HRTFs). Also worked on modelling and interpolation of HRTFs.

Undergraduate Summer Intern 05/20/1999 to 06/25/1999
Centre for Artificial Intelligence and Robotics, Bangalore, India
Advisor: Dr. Ambalal V. Patel

- Implemented PI and PD controller using Fuzzy Logic.

Robotics Camp 06/03/2000 to 07/03/2000
Indian Institute of Technology, Bombay, India

- Independently designed and built a target seeking obstacle avoiding robot from scratch using an 8051 microcontroller for programming the robot.

JOURNAL PUBLICATIONS

1. *Position Calibration of Microphones and Loudspeakers in Distributed Computing Platforms* Vikas C. Raykar, Igor Kozintsev and Rainer Lienhart, IEEE Transactions on Speech and Audio Processing, Volume 13, Issue 1, pp. 70-83, Jan. 2005.
2. *Speaker Localization using Excitation source information in speech* Vikas C. Raykar, B.Yegnanarayana, S. R. Mahadeva Prasanna and Ramani Duraiswami (accepted for IEEE Trans. on Speech and Audio Processing)

TECHNICAL REPORTS

1. *Extracting frequencies of the pinna spectral notches in measured head related impulse responses* Vikas C. Raykar, Ramani Duraiswami, and B. Yegnanarayana, University of Maryland CollegePark, Department of Computer Science Technical Report, CS-TR-4609, July 2004 (also published as UMIACS-TR-2004-51).

CONFERENCE PUBLICATIONS

1. *Approximate expressions for the mean and the covariance of the maximum likelihood estimator for acoustic source localization* Vikas C. Raykar and Ramani Duraiswami (accepted for ICASSP 2005)
2. *The manifolds of spatial hearing* Ramani Duraiswami and Vikas C. Raykar (accepted for ICASSP 2005)
3. *Automatic position calibration of multiple microphones* Vikas C. Raykar and Ramani Duraiswami (In Proceedings of International Conference on Acoustics, Speech and Signal Processing (ICASSP 2004), Montreal, Quebec, Canada, May 2004, vol. IV, pp. 69 - 72.)
4. *Position calibration of audio sensors and actuators in a distributed computing platform* Vikas C. Raykar, Igor Kozintsev and Rainer Lienhart (In Proceedings of the Eleventh ACM International Conference on Multimedia, Berkeley, CA, USA, November 2003, pp. 572 - 581.)
5. *Self localization of acoustic sensors and actuators on distributed platforms* Vikas C. Raykar, Igor Kozintsev and Rainer Lienhart (ICCV 2003 International Workshop on Multimedia Technologies in E-Learning and Collaboration, Nice, France, October 2003)
6. *Tracking a moving speaker using excitation source information* Vikas C. Raykar, B. Yegnanarayana, S. R. Mahadeva Prasanna and Ramani Duraiswami (Eurospeech 2003, Geneva, September 2003)

7. *Extracting significant features from the HRTF* Vikas C. Raykar, B. Yegnanarayana, Ramani Duraiswami and Larry Davis (In Proceddings of the 9^{th} International Conference on Auditory Display (ICAD 2003), Boston, July 2003, pp. 115 - 118)
8. *Virtual audio system customization using visual matching of ear parameters* D.Zotkin, R.Duraiswami, L.Davis, A, Mohan and V.C.Raykar(ICPR 2002, Quebec City, Canada. August 2002)
9. *Head Related Impulse Response Interpolation for Dynamic Spatialization* T. V. Shreenivas, V.C.Raykar and R.Raman (Texas Instruments DSPS Fest-2k, Bangalore, India, November 2000.)

ABSTRACTS

1. *Extracting the frequencies of the pinna spectral notches in measured head related impulse responses* Vikas C. Raykar, Ramani Duraiswami, and B. Yegnanarayana (to be presented at the 148th meeting of Acoustical Society of America, San Diego, California, November 2004)
2. *A study of pinna anthropometry and the spectral notch frequencies* Vikas C. Raykar, Ramani Duraiswami, and B. Yegnanarayana (to be presented at the 148th meeting of Acoustical Society of America, San Diego, California, November 2004)

PATENTS FILED

1. Three-Dimensional Position Calibration of Audio Sensors and Actuators on a Distributed Computing Platform. (filed on 05/09/2003 along with Igor Kozintsev and Rainer Lienhart)
2. Method for 3-Dimensional position calibration of audio sensors and actuators on a distributed computing platform. (filed on 09/18/2003 along with Igor Kozintsev and Rainer Lienhart)

SKILLS

- Expertise in C, MATLAB & Win32 Programming.
- Experience in building real-time video conferencing systems with Matrox EVI-D30 pan-tilt camera and PowerDAQ data acquisition board.
- Built a real time face detection system using Firewire camera and openCV.
- Coding experience with MIL Image processing library, Intel Integrated Performance Primitives (IPP) Library, openCV and portaudio.
- Working knowledge of C++, FORTRAN, DirectX and Verilog.
- Working knowledge of MPI and openMP.
- DSP Processors including Texas Instruments TMS320C30 and TMS320C54.
- Assembly languages such as 8085, 8086 & 8051/52 microcontrollers.
- Also familiar with packages like MS-Office, LaTeX and HTML programming.

COURSE PROJECTS

- Asymptotic Connectivity in wireless sensor networks.
- Spectral Clustering and kernel PCA are pursuing good projections.
- Unsupervised learning of semantic concepts.
- A survey of nonlinear manifold learning methods.
- A perceptual mapping from images to sounds.
- Image mosiacing, independent motion detection and video manipulation.
- A toolkit to test programs for memory bottlenecks such as cache misses.
- Evaluation of kernel methods like KPCA, KLDA and KBDA for face detection.
- Fast Kernel Principal Component Analysis using multipole methods.
- Classification/Regression using Linear Networks,Perceptrons and RBF's
- Video Codec Implementation, DC Image Extraction and Shot Segmentation.
- Verilog Implementation of pipelined CPU with precise interrupt handling.
- Optimization methods for sound source localization.
- Implementation of the Frost beamformer.

HONORS

- Best Outgoing student in the Electronics and communication Engineering Department at Regional Engineering College, Trichy, India for the year 2000-2001.
- Recipient of the prestigious National Science Fellowship Award (Engineering Stream) for the year 1999 under the KVPY scheme funded by the Department of Science and Technology (DST),Government of India.
- Recipient of the National Talent Search Examination (NTSE) scholarship in the year 1995.
- Was 18th rank in State level Entrance Examination into engineering Colleges.
- Was 13th rank in State level public examination.
- Was 2nd rank in Karnataka State in X standard public examination.

INTERESTS Sketching, Painting, Amateur robotics.

REFERENCES

- Dr.Ramani Duraiswami (Assistant Professor, Department of Computer Science and Director, Perceptual Interfaces and Reality Laboratory, University of Maryland, CollegePark)
- Dr.B. Yegnanarayana (Visiting Professor, University of Maryland, CollegePark and Professor, Dept. of Computer Science and Engineering Indian Institute of Technology Madras)
- Dr.Rama Chellappa (Professor, Department of Electrical Engineering and Director of the Center for Automation Research, at the University of Maryland in College Park)
- Dr. Igor Kozintsev (Researcher, Architecture Research Lab, Intel Research Labs, Santa Clara, CA)
- Dr. Rainer Lienhart (Professor, Computer Science department, University of Augsburg, Germany)