

JUNGHOOON LEE

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EDUCATION

Ph.D., 2006, School of Electrical and Computer Engineering, Purdue University West Lafayette, IN

M.S., 1999, Department of Biomedical Engineering, Seoul National University, Seoul, Korea

B.S., 1997, School of Electrical Engineering, Seoul National University, *cum laude*, Seoul, Korea

RESEARCH INTERESTS

- Statistical signal/image processing algorithm design and software implementation, inverse problems.
- 3-D reconstruction algorithm design and software implementation.
- Limited angle tomography, compressed sensing.
- Prostate brachytherapy seed reconstruction using mobile C-arm.
- Biomedical signal processing, medical imaging problems.
- Nonlinear optimization, estimation theory, pattern recognition, computer vision.

WORK EXPERIENCE

1/2007 – current **Image Analysis and Communications Lab., Department of Electrical and Computer Eng.,
NSF Engineering Research Center for Computer-Integrated Surgical Systems
and Technology, The Johns Hopkins University** **Baltimore, MD**

Postdoctoral Fellow

- 3-D reconstruction algorithm for x-ray cone-beam tomography.
- Prior model and atlas enhanced cone-beam tomography with mobile C-arm.
- Limited angle tomography.
- Tomosynthesis-based radioactive seed localization in prostate brachytherapy.
- Model-based simultaneous C-arm pose tracking and prostate brachytherapy seed localization.

8/2002 – 12/2002 **School of Electrical and Computer Engineering, Purdue University** **West Lafayette, IN**

Research Assistant

- 3-D reconstruction and pattern classification of multiple types of virus particle from mixtures of cryo electron microscope images.
- Fast algorithms for computing 3-D reconstructions from unoriented projections.
- Nonlinear optimization / Parallel computing.

3/1998 – 12/1998 **Department of Radiology, Seoul National University** **Seoul, Korea**

Research Assistant

- Image guided neurosurgery / Total artificial heart virtual surgery.

- 11/1997 – 2/1998 Electronics and Telecommunication Research Institute Daejeon, Korea**
Researcher ▪ ASIC layout design for the total artificial heart controller.
- 7/1996 – 2/1999 Artificial Heart Lab., Seoul National University, Seoul, Korea**
Research Assistant ▪ Development of transcutaneous information transmission system hardware and software for the total artificial heart internal and external controller.
 ▪ Total artificial heart controller design and animal experiments.
- 6/2001 – 6/2002 Armed Forces Masan Hospital Masan, Korea**
Medical Service Officer ▪ Medical equipment management and maintenance.
- 10/1999 – 6/2001 The second Logistics Support Command Eujungboo, Korea**
Medical Service Officer ▪ Medical equipment management and maintenance.
- 7/1999 – 10/1999 Armed Forces Medical School Daejeon, Korea**
Medical Service Officer ▪ Medical Service Officer Basic Course (OBC) training

HONORS & AWARDS

- Student Travel Award, IEEE International Symposium on Biomedical Imaging, 2008
- Commander in Chief of Medical Affairs Award (The Best Graduate), Armed Forces Medical School, 1999.
- Soo-Suk Scholarship given by Dong-A Socio Group, 1993-1997.
- Fellowship, Seoul National University, Fall, 1993.

RELEVANT COURSES

Digital Signal Processing, Digital image processing I/II, Medical imaging with applications, Statistical inference, Pattern recognition and decision making processes, Decision theory and Bayesian analysis, Optimization theory, Linear algebra, Understanding nervous system, Computer applications to medical system, Linear system theory, Neural networks, Biosensor, Introduction to biomedical engineering, Medical ultrasound theory, Computer vision.

COMPUTER SKILLS

Windows, DOS, UNIX, LINUX, C/C++, Matlab, Spider/Web, Bsoft , Take

ACADEMIC SUPERVISION AND MENTORING

- **Nathanael Kuo.** Research on " Prior model and atlas enhanced cone-beam tomography with a mobile C-arm and cadaver experiments", Spring 2008 – present.
- **Maria Ayad.** Research on "Model-based Pose Estimation of a Mobile C-Arm", Fall 2007– present.
- **Brian Bubnash.** Senior project on "Geometric Dewarping Grid Design for C-Arm", Fall 2007 – Spring 2008.

PUBLICATIONS

Journal Articles:

- M. Ayad, **J. Lee**, J. L. Prince, G. Fichtinger, "Plan-based simultaneous C-arm pose tracking and prostate brachytherapy seed localization", (in preparation).
- O. Sadowsky, **J. Lee**, K. Ramamurthi, J. L. Prince, R. H. Taylor, "Prior-model and atlas enhanced cone-beam tomography with a mobile C-arm", *Med. Phys.* (in preparation).
- **J. Lee**, P. C. Doerschuk, G. Lander, J. E. Johnson, "A fast algorithm for statistical 3-D processing of cryo electron microscope images of mixtures of multiple types of virus particles", (in preparation).
- **J. Lee**, X. Liu, A. K. Jain, J. L. Prince, G. Fichtinger, "Prostate brachytherapy seed reconstruction with Gaussian blurring and optimal coverage cost", *IEEE Trans. Medical Imaging* (in preparation).
- J. -H. Han, **J. Lee**, B. J. Jung, T. G. Lee, "Compact optical image scanning of two-dimensional microstructure surface patterns", (in preparation).
- **J. Lee**, Z. Yin, P. C. Doerschuk, J. Tang, J. E. Johnson, "Automatic simultaneous classification and 3-D reconstruction of multiple types of viruses from cryo electron microscope images showing a mixture of all types", *Journal of Structural Biology* (in revision).
- **J. Lee**, P. C. Doerschuk, J. E. Johnson, "Exact reduced-complexity maximum likelihood reconstruction of multiple 3-D objects from unlabeled unoriented 2-D projections and electron microscopy of viruses", *IEEE Trans. Image Processing*, Vol. 16, Issue 12, pp 2865-2878, 2007.
- J. Chung, J. H. Lee, J. Choi, **J. Lee**, W. G. Kim, K. Sun, B. G. Min, "Home care artificial heart monitoring system via internet", *The International Journal of Artificial Organs*, Vol. 27, No. 10, pp 898-903, 2004.
- J. M. Ahn, **J. H. Lee**, S. W. Choi, W. E. Kim, K. S. Om, S. K. Park, W. G. Kim, J. R. Roh, B. G. Min, "Implantable control, telemetry, and solar energy system in the moving actuator type total artificial heart", *Artificial Organs*, vol.22, no.3, pp250-259, 1998.
- K. S. Om, J. M. Ahn, W. W. Choi, S. K. Park, S. J. Kim, Y. H. Jo, J. S. Choi, **J. H. Lee**, J. H. Choi, H. C. Kim, B. G. Min, "A study on the practical estimation of nonlinear hemodynamic variables for the moving actuator type total artificial heart", *Journal of Korean Society of Medical and Biological Engineering*, vol.19 no.2, pp153-161, 1998.

Conference Proceedings and Presentations :

- **J. Lee**, X. Liu, J. L. Prince, G. Fichtinger, "Prostate brachytherapy seed localization with Gaussian blurring and camera self-calibration", *International Conference on Medical Image Computing and Computer Assisted Intervention* (accepted).
- **J. Lee**, X. Liu, A. K. Jain, J. L. Prince, G. Fichtinger, "Tomosynthesis-based radioactive seed localization in prostate brachytherapy", *IEEE International Symposium on Biomedical Imaging*, Paris, France, May 14-17, 2008.
- **J. Lee**, P. C. Doerschuk, J. E. Johnson, "Simultaneous 3-D image reconstruction and classification with applications to structural virology", *Optical Society of America, Signal Recovery and Synthesis*, Vancouver,

BC, Canada, June 18-20, 2007.

- **J. Lee**, Y. Zheng, P. C. Doerschuk, "Computing the 3-D structure of viruses from unoriented cryo electron microscope images: a fast algorithm for a statistical approach", *IEEE 2006 International Conference of the Engineering in Medicine and Biology Society*, New York City, New York, USA, Aug. 30-Sep. 3, 2006.
- **J. Lee**, Y. Zheng, P. C. Doerschuk, "A fast algorithm for 3D reconstruction from unoriented projections and cryo-electron microscopy of viruses", IS&T/SPIE 18th Annual Symposium, *Electronic Imaging*, San Jose, California, U.S.A., Jan. 15-19, 2006.
- **J. Lee**, P. C. Doerschuk, J. Tang, J. E. Johnson, "Computing the 3-D structure of viruses from electron microscope images", Optical Society of America, *Signal Recovery and Synthesis*, Charlotte, NC, U.S.A., June 6-9, 2005 (abstract only).
- **J. Lee**, P. C. Doerschuk, J. Tang, J. E. Johnson, "Computing the 3-D structure of viruses from electron microscope images", *IEEE International Conference on Acoustics, Speech, and Signal Processing*, Philadelphia, U.S.A., Mar. 18-23, 2005.
- **J. Lee**, Y. Zheng, P. C. Doerschuk, J. Tang, J. E. Johnson, "Maximum likelihood 3-D reconstruction of multiple viruses from mixtures of cryo electron microscope images", IS&T/SPIE 17th Annual Symposium, *Electronic Imaging*, San Jose, California, U.S.A., Jan. 16-20, 2005.
- **J. Lee**, Z. Yin, P. C. Doerschuk, J. E. Johnson, "Processing electron micrographs of spherical viruses: Joint ab initio 3-D reconstructions and classification", 1st Annual Viruses & Protein Cages as Materials 2004, Center for Bio-Inspired Nanomaterials, Montana State University, Bozeman, Montana, Aug. 1 - Aug. 3, 2004 (abstract only).
- S. W. Lee, J. H. Choi, **J. H. Lee**, J. J. Lee, K. S. Om, J. M. Ahn, B. G. Min, "Development of an external telemetry and controller system for the Total Artificial Heart", *Proc. of KOSOMBE Fall Conference*, vol.20, No.2, pp.243-244, 1998.
- J. J. Lee, J. H. Choi, **J. H. Lee**, S. W. Lee, K. S. Om, J. M. Ahn, B. G. Min, "Backdraft characteristics analysis of the polymer valve for the total artificial heart", *Proc. of KOSOMBE Fall conference*, vol.20, No.2, pp.241-242, 1998.
- **J. H. Lee**, W. E. Kim, J. H. Choi, J. J. Lee, J. S. Choi, B. G. Min, "In-vitro and in-vivo evaluation of the transcutaneous optical information transmission system for total artificial heart", *Proc. of KOSOMBE Spring Conference*, vol.20, No.1, 1998.
- J. H. Choi, J. S. Choi, Y. H. Cho, W. E. Kim, **J. H. Lee**, J. M. Ahn, B. G. Min, "An Automatic control algorithm based on the variation of the heart rate for the implantable ventricular assist device", *Proc. of KOSOMBE Spring conference*, vol.20, No.1, pp.267-268, 1998.
- J. S. Choi, W. W. Choi, J. M. Ahn, **J. H. Lee**, B. G. Min, "An automatic controller for load-sensitive control of assist flow in electro-hydraulic type ventricular assist device", *World congress on medical physics and biomedical engineering*, Nice, vol.35, supplement part 1, p587, September, 1997 (abstract only).
- **J. H. Lee**, J. M. Ahn, W. E. Kim, B. G. Min, "A transcutaneous information transmission system using near

infrared light for the moving actuator type total artificial heart", *World congress on medical physics and biomedical engineering*, Nice, vol.35, supplement part 2, p1195, September, 1997 (abstract only).

- S. W. Yi, J. M. Ahn, K. S. Om, J. S. Choi, **J. H. Lee**, W. E. Kim, B. G. Min, "New challenge of the CPU for a moving-actuator type total artificial heart", *Proc. of KOSOMBE conference*, vol.19, no.2, pp118-121, 1997.
- J. H. Choi, W. W. Choi, K. S. Om, **J. H. Lee**, B. G. Min, "Fuzzy gain of PI speed controller depending on afterloads in total artificial heart", *Proc. of KOSOMBE conference*, vol.19, no.1, pp156-160, 1997.
- **J. H. Lee**, W. E. Kim, J. H. Choi, J. M. Ahn, B. G. Min, "Development of a transcutaneous optical information transmission system for total artificial heart using near infrared laser", *Proc. of KOSOMBE conference*, vol.19, no.1, pp64-67, 1997.
- K. S. Om, J. M. Ahn, **J. H. Lee**, J. H. Choi, W. E. Kim, B. G. Min, "The supervisory control system in a moving-actuator type total artificial heart: thought and progress", *Proc. of KOSOMBE conference*, vol.19, no.1, pp55-58, 1997.
- J. J. Lee, W. W. Kim, **J. H. Lee**, J. H. Choi, B. G. Min, "Simulation of photon propagation for transcutaneous optical communication", *Proc. of KOSOMBE conference*, vol.18, no.2, pp65-67, 1996.
- J. H. Choi, **J. H. Lee**, W. W. Choi, J. S. Choi, B. G. Min, "Implementation of a circuit for the enhancement of signal to noise ratio of current signal in the electromechanical total artificial heart", *Proc. of KOSOME conference*, vol.18, no.2, pp277-280, 1996.
- **J. H. Lee**, J. H. Choi, W. E. Kim, J. M. Ahn, B. G. Min, "A study on miniaturization of digital controller for both total artificial heart and ventricular assist device using PSD302", *Proc. of KOSOMBE conference*, vol.18, no.2, pp273-276, 1996.

Theses:

- **J. Lee**, "A fast algorithm for maximum likelihood 3-D signal reconstruction from 2-D projections of unknown orientation and applications to the electron microscopy of viruses", *Ph.D. Thesis, Purdue University*, 2006
- **J. H. Lee**, "A study on transcutaneous information transmission for total artificial heart", *M.S. Thesis, Seoul National University*, 1999.
- **J. H. Lee**, "Audio power amplifier design and the performance analysis", *B.S. Thesis, Seoul National University*, 1997.

Invited Talk:

- "Maximum Likelihood 3-D Reconstruction of Multiple Viruses from Mixtures of Cryo Electron Microscope Images", Samsung Advanced Institute of Technology (SAIT), Korea, Dec., 2005.

REFERENCES

Peter C. Doerschuk Professor, School of Electrical and Computer Eng., Cornell University, 305 Phillips Hall
Cornell Univ., Ithaca, NY 14853-5401, (607) 255-2152, pd83@cornell.edu.

- Jerry L. Prince** Professor, Department of Electrical and Computer Eng., Johns Hopkins University, 201B Clark Hall, 3400 N. Charles St., Baltimore, MD 21218, (410) 516-5192, prince@jhu.edu.
- Gabor Fichtinger** Associate professor, School of Computing, Queen's University, 725 Goodwin Hall, 25 Union St. Kingston, ON, K7L 3N6, Canada, (613) 533-3258,, gabor@cs.queensu.ca.
- Charles A. Bouman** Professor, School of Electrical and Computer Eng., Purdue University, 1285 Electrical Eng. Bldg., West Lafayette, IN 47907-1285, (765) 494-0340, bouman@ecn.purdue.edu.
- John E. Johnson** Professor, Department of Molecular Biology, The Scripps Research Institute, 10550, N. Torrey Pines Rd., La Jolla, CA 92037, (858) 784-9705, jackj@scripps.edu.