

Dan Ruan

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Education

- The University of Michigan** Ann Arbor, MI, USA
 - Ph.D candidate in Electrical Engineering: Systems. (**GPA 8.2/9.0**)
Adviser: Professor J. A. Fessler
- The University of Michigan** Ann Arbor, MI, USA
 - M.S. (expected Jan. 2008), Mathematics.
- Boston University** Boston, MA, USA
 - MSEE in Electrical Engineering. (**GPA 3.98/4.0**)
- Wuhan University** Wuhan, Hubei, P.R.China
 - B.S. in Electrical Engineering (with the highest honor). (**GPA 92.7/100**)

Research Interests

Time series analysis, statistical signal estimation and filtering, model validation/justification, adaptive control, nonlinear programming, integer programming, functional analysis, differential topology and geometry.

Work Experience

- Graduate Student Research Assistant** 2004- Present
 - Department of Electrical Engineering and Computer Science
 - The University of Michigan, Ann Arbor, MI, USA
supervisor: Professor J. A. Fessler
 - carried out complexity and irregularity analysis for respiratory motion, proposed a universal index to characterize the irregularity of quasi-periodic signals.
 - investigated and proposed a nonrigid registration approach that accommodates local tissue rigidity property.
 - derived analytical expressions for covariance and local impulse response analysis for nonrigid registration problems.
- Research Assistant** 2002 - 2004
 - Department of Electrical and Computer Engineering
 - Boston University, Boston, MA, USA
supervisor: Prof. D. A. Castañón and Prof. S. Jiang (Harvard Medical School)
 - derived and implemented a modified interactive multiple model that accommodates missing observation for real-time adaptive tracking.
 - developed a normalized proper orthogonal decomposition for data compression.
 - managed the video processing division of the MARS GRAVITY BIO-SATELLITE project, proposed the infrastructure for real-time image processing with tight bit budget, implemented the core modules currently in use.

Teaching Assistant

2001-2002

Department of Electrical and Computer Engineering

- Boston University, Boston, MA, USA

course name: Microprocessor (SC450), supervisor: Prof. T. Toffoli

- substituted 2 lectures; led discussion hours and lab sessions.
- supervised and graded design projects; helped with the design and grading of term papers.

Publications

- **Journal papers:**

- D. Ruan, J. A. Fessler and J. Balter, Inference of Internal Respiratory Tumour Motion from External Surrogates: A State Augmentation Approach in Modeling Hysteressi. *Phys. Med. Biol.*, submitted, 2007.
- D. Ruan, J. A. Fessler and J. Balter, Static and Recursive Estimation of Respiratory Motion with Instantaneous Phase Adjustment. *Med. Phys.*, in preparation, 2007.
- D. Ruan, J. A. Fessler and J. Balter, Real-time Prediction of Respiratory Motion based on Local Regression Methods. *Phys. Med. Biol.*, 52 (2007) pp. 7137-52. available online at <http://stacks.iop.org/0031-9155/52/7137>.
- D. Ruan, J. A. Fessler and J. Balter, Adaptive Ellipse Tracking. *IEEE Trans. Pattern Recognition & Machine Learning*. ready for submission, 2007.
- D. Ruan, J. A. Fessler and J. Balter, Mean Position Tracking for Respiratory Motion, *Med. Phys.* accepted, 2007.
- D. Ruan, J. A. Fessler and J. Balter, Instantaneous Phase Estimation and its Application to Breathing Trace Prediction, *Med. Phys.* ready for submission. 2006.
- D. Ruan, J. A. Fessler, M. Roberson, J. Balter and M. Kessler, Nonrigid Registration with Regularization Incorporating Local Tissue Rigidity. *Phys. Med. Biol.* in revision, 2006.
- H. He, D. Ruan, K. C. Mehta, X. Gilliam and F. Wu, Nonparametric Independent Component Analysis for Detecting Pressure Fluctuation Induced by Roof Corner Vortex, *J. Wind. Eng. & Ind. Aerodyn.* (2006) available online doi:10.1016/j.jweia.2006.08.006.
- D. Ruan, J. A. Fessler, J. M. Balter and J. Sonke, Exploring Breathing Pattern Irregularity with Projection-based Method, *Med. Phys.*, Vol. 33, Issue 7, Jul 2006, pp 2491-2499.
- D. Ruan, D. A. Castañón, G. Sharp and S. Jiang, Real-time Tumor Prediction: Interactive Multiple Model Filter with Limited Observations, *IEEE. Tr. PAMI.*, in preparation, 2005.
- D. Ruan, H. He, D. A. Castañón and K. C. Mehta, Normalized Proper Orthogonal Decomposition (NPOD) for Building Pressure Data Compression. *J. Wind. Eng. & Ind. Aerodyn.*, Vol. 94, Issue 6, June 2006, pp. 447-461.

- **Conference papers:**

- D. Ruan, J. A. Fessler, J. Balter, Tracking of Respiratory Motion with Real-time Phase Adjustment, *AAPM*, Jul. 2007.
- D. Ruan, J. A. Fessler, M. Roberson, J. Balter and M. Kessler, Multi-modality Registration with Regularization that Accommodates Local Tissue Rigidity, *AAPM*, Aug. 2006, **selected for long presentation at the John S. Laughlin Science Council Research Symposium.**
- D. Ruan, J. A. Fessler, M. Roberson, J. Balter and M. Kessler, Nonrigid Registration with Regularization that Accommodates Local Tissue Rigidity, presented *SPIE*, Feb. 2006.
- D. Ruan, J. A. Fessler, M. Roberson, J. Balter and M. Kessler, Nonrigid Registration Method Incorporating Tissue Difference Information, *GLC-AAPM*, presented, Nov. 2005. (**1st Prize Winner in Young Investigators' Symposium**)
- D. Ruan, J. A. Fessler, M. Roberson, J. Balter and M. Kessler, Nonrigid Registration using Regularization that Accommodates Local Tissue Rigidity, *SPIE*, accepted, 2005.
- D. Ruan, J. A. Fessler, J. Balter, J. Wolthaus and J. Sonke, Analysis of Periodicity and Complexity of Breathing Pattern for Radiotherapy, *AAPM '05*, presented, July. 2005.
- T. R. F. Fulford-Jones, D. Ruan, W. R. Chan, K. Hartman, A. M. Heafitz, A. C. Misra and T. B. Mloduchowski, The Mars Gravity Biosatellite: Innovations in Murine Motion Analysis and Life Support. *Proc. of the 2005 Int. Conf. on Env. Sys.*, Rome, Italy, July 2005.
- D. Ruan, H. He, D. A. Smith and K. C. Mehta, A Semi-optimal Mode Selection Scheme for POD Based Compression of Building Pressure Data, *ASEM '04*, Sep. 2004.
- G Sharp, S. B Jiang, D. Ruan, D. A. Castañón and H. Shirato, Evaluation of Prediction Methods for Real-Time Tumor Tracking During Treatment, *AAPM '03. Medical Physics* 30(6):1346, 2003(abstract).
- D. Ruan, D. A. Castañón, G. Sharp and S. Jiang, Real-time Tumor Tracking with Interactive Multiple Model Filter, *CenSSIS '03*.

Skills

Languages: Matlab, C, C++, VC, Delphi, AVS, Javascript.

Operating Systems: Linux, Solaris, Mac OS, MS Windows.

Awards and Honors

- Barbour Fellowship Recipient (2007).
- Invited Talk to Radiation Oncology Dept., Stanford University (Feb. 2007).
- Selected Presentation at John S. Laughlin Science Council Research Symposium, *AAPM '06* (Aug. 2006).
- Barbour Fellowship Finalist (Feb. 2006).
- International Student Fellowship (Dec. 2005).
- First Prize Winner for Young Investigator Symposium *AAPM-GLC* (Nov. 2005).