

# Ashok Ramasubramanian

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## Education

### **Dept. of Biomedical Engineering, Washington University, St.Louis, MO (2002-Present)**

Post-Doctoral Research. Advisor: Professor Larry Taber

Research Topic: Biomechanics and Biomechanical feedback in Early Cardiac Development

### **Thayer School of Engineering, Dartmouth College, Hanover, NH (1998-2002)**

Ph.D. in Engineering Sciences.<sup>1</sup> Advisor: Professor Laura Ray

Research areas: control theory, adaptive filtering

Ph.D. Thesis: Investigations in Non-Model-Based Friction Compensation

### **University of Massachusetts, North Dartmouth, MA (1996-1998)**

M.S. in Electrical Engineering. Advisor: Professor Karen Payton

Research areas: signal processing, acoustics

M.S. Thesis: Wavelet-Based Amplitude Compression of Speech

### **Anna University, Chennai, India. (1992 – 1996)**

B.E. in Electronics and Communication Engineering

## Academic Honors

2009 Finalist for Stillman Prize for Outstanding Teaching

2004 NIH Ruth L. Kirschstein PostDoctoral Fellowship

2004 American Heart Association PostDoctoral Fellowship<sup>2</sup>

1998 Dartmouth College Henry J. McCarthy Fellowship

1992 Admitted to Anna University in India (very low acceptance rate)

## Research Experience

### PostDoctoral Research

#### **Experimental and Computational Analysis of Early Cardiac Morphogenesis**

An inter-disciplinary approach involving computational (finite element) and experimental (chick embryo) models is used to study biomechanics and biomechanical feedback in embryonic heart development.

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<sup>1</sup>Dartmouth College's engineering school is not divided into departments. Most of my coursework and my thesis were in Mechanical Engineering in the field of Control Theory.

<sup>2</sup>NIH and AHA awards are mutually exclusive. NIH award was chosen.

## Doctoral Thesis

### Non-Model-Based Friction Estimation and Compensation

Friction is estimated without using a structured nonlinear model of surface-level interactions. Techniques such as Kalman filtering are used to extract the unknown friction torque from position/velocity measurements and the known system dynamic equations.

## Masters Thesis

### Amplitude Compression of Speech

A novel wavelet-based method to provide amplitude compression (one mechanism to compensate for sensori-neural hearing loss) was devised and tested.

## Industrial Experience

### Signal Processing Engineer, The MathWorks, Inc. (Summer 1998 & Summer 2000)

Wrote adaptive filter functions for the new MATLAB filtering toolbox. Was in charge of the project from start to finish (Summer 2000). Wrote new functions and updated existing functions in the Linear Prediction portion of the MATLAB Signal Processing Toolbox (Summer 1998).

### Signal Processing Engineer, DSP Software Engineering, Inc. (Summer 1997)

Tested DSPSE software vocoders (G.728 etc.) on TI DSPs to make sure that they complied with International Telecommunications Union (ITU-T) recommendations.

## Teaching Experience

### Assistant Professor, Union College (Sep 2007 - Present)

Teaching various classes in Mechanical Engineering.

### Volunteer Math Tutor, St. Louis Public School District (Nov 2005 - Jul 2007)

Taught adults high school-level mathematics to help them prepare for the GED examination.

### Mentor for undergraduate student interns (2003 - Jul 2007)

Supervised and guided undergraduate students seeking research experience in Dr. Taber's laboratory.

### Teaching Assistant for various courses during masters and doctoral education

Grading, laboratory instruction, and occasional classroom instruction for classes in material science, digital signal processing, control theory, and digital control theory.

## Professional Activities

Reviewer, Annals of Biomedical Engineering

Reviewer, ASME Journal of Dynamic Systems, Measurement, and Control

Member, American Society of Mechanical Engineers

Member, Engineers Without Borders

## Grant Funding

1F32 HL079764      12/15/04 – 12/14/06  
 NIH/NHLBI      \$109,536

Title: Role of Mechanical Forces in Cardiac C-looping

Goal: To determine biomechanical forces responsible for cardiac c-looping through experimental and computational methods.

Role: PI

## Publications

### Journal Papers

1. L. R. Ray, A. Ramasubramanian, and J. R. Townsend “Adaptive Friction Compensation Using Extended Kalman-Bucy Filter Friction Estimation,” *Control Engineering Practice*, Vol. 9, pp. 169–179, 2001
2. L. R. Ray, J. R. Townsend, and A. Ramasubramanian, “Optimal Filtering and Bayesian Detection for Friction-Based Diagnostics in Machines,” *ISA Transactions*, Vol. 40, pp. 207–221, 2001
3. K. S. Latacha, M. C. Remond, A. Ramasubramanian, A. Y. Chen, E. L. Elson, and L. A. Taber, “Role of Actin Polymerization in Bending the Early Heart Tube”, *Developmental Dynamics*, Vol. 233, pp. 1272–1286. 2005
4. A. Ramasubramanian, K.S. Latacha, J.M. Benjamin, D.A. Voronov, A. Ravi, and L.A. Taber, “Computational Model for Early Cardiac Looping”, *Annals of Biomedical Engineering*, Vol. 34, pp. 1355–1369. 2006
5. N.L. Nerurkar, A. Ramasubramanian, and L.A. Taber, “Morphogenetic Adaptation of the Looping Embryonic Heart to Altered Mechanical Loads”, *Developmental Dynamics*, Vol. 235, pp. 1822–1829, 2006
6. A. Ramasubramanian and L. R. Ray, “Comparison of EKBF-based and Classical Friction Compensation”, *ASME Journal of Dynamic Systems, Measurement, and Control*, Vol. 129, pp. 236–242, 2007<sup>3</sup>
7. A. Ramasubramanian and L.A. Taber, “Computational Modeling of Morphogenesis Regulated by Mechanical Feedback”, *Biomechanics and Modeling and Mechanobiology*. In Press.
8. Ramasubramanian A, Nerurkar N. L., Achtien K. H., Filas B. A., Voronov D. A., Taber L. A., “On modeling morphogenesis of the looping heart following mechanical perturbations”, *Journal of Biomechanical Engineering*, Vol. 130, 2008

<sup>3</sup># 4 in the list of most-downloaded articles in April 2007 for this journal

### Conference Proceedings and Abstracts

1. A. Ramasubramanian, K. Payton, and A. H. Costa, "A Comparison Between Conventional and Wavelet Based Amplitude Compression Schemes," *Proceedings of the IEEE-SP International Symposium on Time-Frequency and Time-Scale Analysis*, Pittsburgh, PA. pp. 161 - 164, 1998
2. A. Ramasubramanian and L. R. Ray, "Adaptive Friction Compensation Using Extended Kalman-Bucy Filter Friction Estimation: A Comparative Study," *Proceedings of the American Control Conference* Chicago, IL. pp. 2588-2594, 2000
3. A. Ramasubramanian and L. R. Ray, "Stability and Performance Analysis for Non-Model-Based Friction Estimators," *Proceedings of the Control and Decision Conference*, Orlando, FL. pp. 2929-2935, 2001
4. A. Ramasubramanian and L. R. Ray, "Friction Cancellation in Flexible Systems using Extended Kalman-Bucy Filtering," *Proceedings of the American Control Conference*, Denver, CO. pp. 1062-1067, 2003
5. A. Ramasubramanian, K.S. Latacha, and L.A. Taber. "A Computational Model for the Initial Stages of Cardiac Looping". *Proceedings of the Summer Bioengineering Conference*. Vail, Co. 2005
6. A. Ramasubramanian and L.A. Taber "Modeling Mechanical Feedback during Early Cardiac Morphogenesis," *Proceedings of the World Congress of Biomechanics*. Munich, Germany. 2006
7. A. Ramasubramanian, N.L. Nerurkar, K.H. Achten and L.A. Taber. "Role of Mechanical Feedback in Restoration of Normal Cardiac Looping Following Perturbed Loading". *Proceedings of the Summer Bioengineering Conference*. Keystone, Co. 2007

### Talks

1. "Modeling Growth in Embryonic Heart Development Using ABAQUS," Midwest ABAQUS User's Group Meeting. Purdue, Indiana. October 2003
2. "Introduction to Cardiac Development," Tamil Nadu Engineering College, Coimbatore, India. January 2005 (invited)
3. "Finite Element Modeling of Early Cardiac looping," University of Rochester, New York. January 2007.
4. "Biomechanics and Biomechanical Feedback in Early Cardiac Development," Union College faculty candidate seminar. Schenectady, New York. February 2007.
5. "Biomechanics of Early Heart Development," Rensselaer Polytechnic Institute faculty candidate seminar. Troy, New York. March 2007

## References

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