Nathan Marshall Wilson

PERSONAL DATA
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EDUCATION

Stanford University, Stanford, CA
Doctor of Philosophy, Mechanical Engineering, December 2002
Master of Science, Mechanical Engineering, September 1997

Virginia Tech, Blacksburg, VA
Bachelor of Science, Mechanical Engineering, May 1996, Cum Laude

EXPERIENCE

Stanford University
Department of Surgery, Stanford, CA (Engineering Research Associate)

January 2003 – present

- Extended and maintained the core software architecture I developed for the Cardiovascular Biomechanics Research Laboratory that integrates medical image processing, automatic mesh generation, finite-element based numerical simulation, and scientific visualization utilizing best in-class commercial and open-source libraries including the Visualization Toolkit (VTK) and the Insight Segmentation and Registration Toolkit (ITK) into a single, unified software application for cardiovascular biomechanics research.
- Developed software for a joint Stanford/Stanford Research Institute led industrial consortium to quantify deformations and loading on the superficial femoral artery relevant to stent design and failure mechanisms.
- Supported image-based patient-specific and animal-specific geometric model construction and hemodynamic simulation of the arterial and venous vascular system including applications in the aortic arch, infra-renal aorta, lower extremities, pulmonary arteries, and carotid arteries with emphasis on acquired and congenital vascular disease including abdominal aortic aneurysms, stenoses, and peripheral vascular occlusive disease.
- Led software development and coordinated computational resources for the Cardiovascular Biomechanics Research Laboratory to support a multi-million dollar National Science Foundation contract on “Simulation Based Medical Planning for Cardiovascular Disease.”

Stanford University
Department of Mechanical Engineering, Stanford, CA (Doctoral Research under Charles A. Taylor and Robert W. Dutton)

January 1997 – December 2002

- Developed a general, extensible, modular software framework for computational prototyping that integrated the major stages in computational prototyping.
- Created a system to enable vascular surgeons to preoperatively evaluate different surgical interventions in a patient-specific fashion for patients with aorto-iliac occlusive disease.
- Developed geometric algorithms enabling the creation of geometry of realistic dimensions for Micro-Electro-Mechanical Systems simulation with different levels of physical accuracy.

Stanford University
Division of Biomechanical Engineering, Department of Mechanical Engineering, Stanford, CA (System Administration Position)

September 2002 – December 2002

- Coordinated the installation and configuration of $40,000 of computer hardware to establish a Windows based departmental computer cluster.
- Upgraded, maintained, supported a computer lab of 6 SGI UNIX workstations and 15 Microsoft Windows (NT/2000/XP) based high performance computers.

National Aeronautics and Space Administration
Langley Research Center, Hampton, VA (Mechanical Engineering Position)

June 1996 - August 1996
- Developed a general finite element one-dimensional heat transfer code utilizing hierarchical shape functions to investigate fundamental issues relating to the design of *hp*-adaptive strategies.

The Goodyear Tire & Rubber Company
Technical Center, Akron, OH (Mechanical Engineering Position)

January 1995 - May 1995
- Extensively tested a commercial finite element package (ABAQUS) for use in non-linear, transient heat transfer analysis and enhanced the capabilities of the code by writing user subroutines to account for the physical changes in rubber during the vulcanization process.
- Presented findings at a user group meeting and co-authored a feasibility study comparing ABAQUS to in-house proprietary modeling software.

May 1994 - August 1994
- Facilitated the implementation of computer aided engineering by streamlining and automating the tire modeling process using graphical user interfaces written in a scripting language (TCL) and toolkit (TK).

August 1993 - January 1994
- Conducted an extensive statistical analysis of 48 physical, chemical, and process variables with 1.5 million pieces of data from a plant and co-authored a report recommending methods to reduce the defect rate.

E. I. du Pont de Nemours & Company
Seaford Plant, Seaford, DE (Mechanical Engineering Position)

January 1993 - May 1993
- Installed, verified, and debugged new, proprietary machinery.
- Managed safety issues, training, and technical documentation for new factory equipment.

AWARDS
Intel Foundation Fellowship, 2000-2001
Phi Kappa Phi, 1996
Pi Tau Sigma, 1995
Tau Beta Pi, 1994
Best General Chemistry Student, Virginia Tech, 1991-1992

PUBLICATIONS
N.M. Wilson, F.R. Arko, and C.A. Taylor, "Predicting Changes in Blood Flow in Patient-Specific Operative Plans for Treating Aortoiliac Occlusive Disease," accepted for publication in Computer-Aided Surgery.

A. Les, J.M. Greve, M.K. O'Connell, N.M. Wilson, I. Vignon, E. Sho, R. Dalman, and C.A. Taylor, "A Comparative Study of Hemodynamic Conditions in Normal and Aneurismal Mouse, Rat, and Human Abdominal Aortas," accepted for publication in the Proceedings of the American Society of Mechanical Engineers Summer Bioengineering Conference, 2005.

J.M. Greve, A.S. Les, M.K. O'Connell, N.M. Wilson, E. Sho, R.L. Dalman, and C.A. Taylor, "Development of Methods to Non-Invasively, Longitudinally Quantify Hemodynamics in a Rat Model of Abdominal Aortic Aneurysm Using Magnetic Resonance Imaging and Computational Fluid Dynamics," accepted for publication in the Proceedings of the American Society of Mechanical Engineers Summer Bioengineering Conference, 2005.

B. Song, R. Bennett, N.M. Wilson, J.W. Simons, D.A. Shockey, C.A. Taylor, and R. Fahrig, "Methods for Imaging and Quantifying Stent Deformation in the Superficial Femoral Artery," accepted for publication in the Proceedings of the American Society of Mechanical Engineers Summer Bioengineering Conference, 2005.

A. Pang, A. Dubin, J. Feinstein, N.M. Wilson, and C.A. Taylor, "Computer Simulation of Venous Occlusion Induced by Pacing Leads," accepted for publication in the Proceedings of the American Society of Mechanical Engineers Summer Bioengineering Conference, 2005.

C.P. Cheng, N.M. Wilson, R.J. Herfkens, and C.A. Taylor , "In Vivo Deformations of the Superficial Femoral Artery – Possible Cause of Stent Fractures?" accepted for publication in the Proceedings of the American Society of Mechanical Engineers Summer Bioengineering Conference, 2005.

C.P. Cheng, C.A. Taylor, N.M. Wilson, and R.J. Herfkens, "Superficial Femoral Artery Deformations Due to Maximal Hip and Knee Flexion: Implications for Stent Design," Proceedings of the International Society for Magnetic Resonance in Medicine, 2005.

N.M. Wilson, F.R. Arko, C.A. Taylor, "Patient-Specific Operative Planning for Aorto-Femoral Reconstruction Procedures," Proceedings of Medical Image Computing and Computer-Assisted Intervention, 2004, LNCS 3217, pp. 422-429.

M. Hope, J. Levin, M. Markl, M. Draney, N. Wilson, and R. Herfkens, "Four-Dimensional Magnetic Resonance Velocity Mapping: Velocity Profile of Blood-Flow through the Thoracic Aorta in 10 Healthy Volunteers," Proceedings of the International Society for Magnetic Resonance in Medicine, 2004.

N.M. Wilson, F.R. Arko, C.K. Zarins, C. Olcott, C.A. Taylor, "Preoperative Computational Modeling of Aortofemoral Reconstructions to Predict Postoperative Hemodynamic Results," Proceedings of the 32nd Annual Symposium on Vascular Surgery, March 10-13, 2004, pg. 110.

C.A. Taylor, E.J. Bekkers, C.A. Figueroa, J.P. Ku, R. Spilker, I. Vignon, N. Wilson, and J.A. Feinstein, "Simulation-Based Medical Planning for Cardiovascular Disease," Proceedings of the 2003 International Biofluids Symposium, Pasadena, CA, Dec. 13-14, 2003.

N. M. Wilson, F. R. Arko, and C. A. Taylor, "An Integrated Software System for Preoperatively Evaluating Aorto-Femoral Reconstruction Procedures," Proceedings of the American Society of Mechanical Engineers Summer Bioengineering Conference, June 25-29, 2003, pp. 899-900.

N. M. Wilson, "Geometric Algorithms and Software Architecture for Computational Prototyping: Applications in Vascular Surgery and MEMS," Ph.D. Thesis, Stanford University, December 2002.

M. T. Draney, M. T. Alley, B. T. Tang, N. M. Wilson, R. J. Herfkens, and C. A. Taylor, "Importance of 3D Nonlinear Gradient Corrections for Quantitative Analysis of 3D Angiographic Data," Proceedings of the International Society for Magnetic Resonance in Medicine, 2002.

N.M. Wilson, K. Wang, R.W. Dutton, and C.A. Taylor, "A Software Framework for Creating Patient Specific Geometric Models from Medical Imaging Data for Simulation Based Medical Planning of Vascular Surgery," Proceedings of Medical Image Computing and Computer-Assisted Intervention, 2001, pp. 449-456.

N. M. Wilson, D. Yergeau, and R. W. Dutton, "Chapter 3: A heterogeneous environment for computational prototyping and simulation based design of MEMS," Final Report: Advanced CAD System for Electromagnetic MEMS Interactive Analysis (Academia), Contract Number: F30602-96-2-0308, 2000, pp. 10-43.

N. M. Wilson, D. Yergeau, and R. W. Dutton, "Internet Based Modeling of Micro-Electro-Mechanical Systems," International Conference of Computational Engineering & Sciences, August 21-25, 2000, pp. 1330-1334.

N. M. Wilson, K. Wang, D. Yergeau, and R. W. Dutton, "GEODESIC: A New and Extensible Geometry Tool and Framework with Application to MEMS," Proceedings of Modeling and Simulation of Microsystems, March 27-29, 2000, pp. 716-719.

N. M. Wilson, P. M. Pinsky, and R. W. Dutton, "Integration of TCAD Tools into CAD Tools for MEMS," United States Association of Computational Mechanics Conference, August 4-6, 1999, pp. 230-231.

N. M. Wilson, S. Liang, P. M. Pinsky, and R. W. Dutton, "A Novel Method to Utilize Existing TCAD Tools to Build Accurate Geometry Required for MEMS simulation," Proceedings of Modeling and Simulation of Microsystems, April 19-21, 1999, pp. 120-123.

N. M. Wilson, P. M. Pinsky, and R. W. Dutton, "Investigation of Tetrahedral Automatic Mesh Generation for Finite Element Simulation of Micro-Electro-Mechanical Switches," Proceedings of Modeling and Simulation of Microsystems, April 19-21, 1999, pp. 305-308.

N. M. Wilson, R. W. Dutton, and P. M. Pinsky, "Utilizing Existing TCAD Simulation Tools to Create Solid Models for the Simulation Based Design of MEMS Devices," Proceedings of International Mechanical Engineering Conference and Exposition, November 15-20, 1998, pp. 565-570.

N.M. Wilson, Z.K. Hsiau, R.W. Dutton, and P.M. Pinsky, "A Heterogeneous Environment for Computational Prototyping and Simulation Based Design of MEMS Devices," Proceedings of SISPAD, September 2-4, 1998, pp. 153-156.

R.W. Dutton, E.K. Chan, N.M. Wilson, Z.K. Hsiau, and S. Shen, "Challenges in Process Modeling for MEMS," Proceedings of Modeling and Simulation of Microsystems, April 6-8, 1998, pp. 1-4.

R. C. Batra and N. M. Wilson, "Adiabatic Shear Bands in Plane Strain Deformations of a WHA," International Journal of Plasticity, Vol. 14, Nos. 1-3, pp. 43-60, 1998.

R.C. Batra and N. M. Wilson, "Analysis of Adiabatic Shear Bands in Plane Strain and Axisymmetric Deformations of a Tungsten Alloy," Proceedings of the Society of Engineering Science 33rd Annual Technical Meeting, Oct. 20-23, 1996, pg. CH-1.

PROFESSIONAL ACTIVITIES

Lab Director, Computer Modeling Methods and Applications, "The Cardiovascular System in Health & Disease, Fundamentals for the Medical Device Industry," Stanford University, Stanford, CA, June 14-17, 2005.

Lab Instructor, "Finite Element Analysis of Cardiovascular Devices," Food and Drug Administration, Rockville, Maryland, September 15-16, 2004.

Lab Director, Computer Modeling Methods and Applications, "The Cardiovascular System in Health & Disease, Fundamentals for the Medical Device Industry," Stanford University, Stanford, CA, June 16-18, 2004.

Lab Director, Computational Methods, "The Cardiovascular System in Health & Disease, Fundamentals for the Medical Device Industry," Stanford University, Stanford, CA, June 11-13, 2003.

Lab Director, Computational Methods, "The Cardiovascular System in Health & Disease, Fundamentals for the Medical Device Industry," Stanford University, Stanford, CA, June 19-21, 2002.

Lab Director, Computational Methods, "The Cardiovascular System in Health & Disease, Fundamentals for the Medical Device Industry," Stanford University, Stanford, CA, September 19-21, 2001.