

SUNIL SAIGAL, Ph.D., P.E., F.ASCE, F.ASME, F.AAAS
Distinguished Professor, Civil and Environmental Engineering
New Jersey Institute of Technology

CONTACT

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EDUCATION

Ph.D., Aeronautics and Astronautics, Purdue University, December 1985

Ph.D. Coursework, Civil and Environmental Engineering, Rensselaer Polytechnic Institute, 1980 - 1981

M.S., Civil Engineering, Indian Institute of Science, Bangalore, India, June 1980

B.S., Civil Engineering, Punjab Engineering College, India, June 1978

LICENSE/CERTIFICATIONS

Professional Engineer (PE) License; Licensed in New York, New Jersey and Pennsylvania
American Concrete Institute Concrete Field Testing Technician Certificate

RESEARCH INTERESTS

Computational Mechanics; Computational Orthopedic Biomechanics (Hip, Spine, Shoulder); Implant Design

ACCREDITATION

Served on the accreditation review teams for:

- Middle States Commission on Higher Education (MSCHE), and
- Accreditation Board for Engineering and Technology (ABET)

CURRENT ENGAGEMENTS

Distinguished Professor, Department of Civil and Environmental Engineering, New Jersey Institute of Technology, January 2013 – present.

Technical Advisor, Acuitive Technologies Inc., Allendale, NJ, January 2013 – present.

Member, International Advisory Board, SRM University, Chennai, India, 2011 – present.

Member, ASCE Continuing Education Blue Sky Task Committee, October 2013 – present. Advising American Society of Civil Engineers (ASCE) on its strategic directions for continuing education.

Member, ASEE Executive Working Group, ASEE Long-Range Planning Committee. To assist American Society of Engineering Education (ASEE) in examining access to and affordability of engineering majors.

PREVIOUS PROFESSIONAL EXPERIENCE

Dean, Newark College of Engineering, also **Distinguished Professor** of Civil and Environmental Engineering, New Jersey Institute of Technology, June 2007 – December 2012

College: The Newark College of Engineering (NCE) at the New Jersey Institute of Technology (NJIT) enrolled 3287 undergraduate and 1343 graduate students for a total of 4630 students. Its annual budget was \$32 M with additional research expenditures in AY 2009-2010 of \$16.1 M. The College was organized into six departments with 115 tenure track faculty members, 12 university lecturers and 64 staff members during my tenure. All of its departments were ranked in the top 100 in the US News and World Record (USNWR) graduate school rankings with an overall ranking of 86 for the College. The College offers degrees at the BS, MS and PhD levels.

Growth: The College experienced a steady growth in undergraduate enrollment, doctoral students and research expenditures during the time I served as Dean. The overall growth in enrollment was 19.8% (from 3866 to 4630), undergraduate enrollment grew by 25% (from 2630 to 3287), and graduate students by 8.7% (from 1236 to 1343). The College enrolled approximately 200 Ph.D. students performing research on cutting-edge interdisciplinary topics.

Faculty Recruitment: Recruited three members of the National Academy of Engineering (NAE), one in full-time position and two in adjunct positions; the Ying Wu Endowed Professor of Electrical and Computer Engineering; Stable Professor of Innovation; two Associate Deans; and four Department Chairmen. Developed a 3-year hiring plan for the college to strengthen presence in strategic areas of the college/university and gain

national prominence and recruited eight (8) faculty members under the first phase of this hiring plan.

Diversity: Created a positive environment for diversity and inclusion of women and underrepresented minorities. Included a female and an African-American (for the first time) in the leadership team of the College of Engineering. Two female faculty members were recruited in tenure track positions in the College through extensive outreach efforts. Financial support and visibility for student organizations for women and underrepresented minority was increased. Organized information sessions in Spanish for Hispanic high-school students to increase Hispanic enrollment in undergraduate programs. Efforts were instituted for enrolling graduate students in Spanish speaking countries.

Research and Innovation: Research expenditures grew by 87.2% (from \$8.6M to \$16.1M); two new centers of excellence – Center for Natural Resources Protection and Development and Center for Brain Imaging – were established. “Idea Factory” was co-founded in collaboration with the College of Architecture and Design to facilitate development of aesthetic products.

Strategic Direction and Assessment: Led the development of a Strategic Vision with the guiding objective of Newark College of Engineering reaching top-25 status by 2025 in USNWR graduate rankings. Reconstituted the Board of Visitors to enhance participation and formulate initiatives to assist the College in reaching its objectives. Signature research areas were developed for focused research growth and resource investment in the next five years. Implemented consistent assessment and improvement strategies college-wide for ABET and Middle States Commission on Higher Education (MSCHE) accreditation for undergraduate and graduate curricula.

Distance Learning: Developed a comprehensive plan for the development of online ‘industry-ready’ MS degrees in all engineering disciplines. The implementation of the plan is underway. The university expects to enroll 1000 online MS students under this plan. Extensive outreach to the industry was made to seek their input in developing programs, to increase exposure of our programs to non-traditional students, and to strengthen industrial ties of the College.

Student Involvement and Engagement: Established Student Advisory Board to include student input in formulating College initiatives and directions. The implementation of Learning Communities was initiated to improve retention via increased student engagement. Partnered with Instructional Technologies Media Services to introduce technology in the classroom. Metrics to assess the effectiveness of technology instruction in classroom were developed. Target of 60% of the faculty engaged in technology enhanced pedagogy by Fall 2013 was achieved.

Undergraduate Accreditation, Curriculum and Research: Led the College through ABET accreditation. All seven programs in the College received accreditation. Steps to institutionalize undergraduate research throughout the College were implemented to provide the students an edge in creative thinking and innovation. A complete upgrade of curriculum was done to allow maximum flexibility in course selection for students. Efforts included redesigning undergraduate design experience vital to student retention in undergraduate engineering programs.

Graduate Curriculum: Led the creation of nine-month Master's programs in each department of the College that includes coursework geared towards maximizing student attractiveness to potential employers. Seven new interdisciplinary M.S. programs were introduced including: Healthcare Management Systems, Pharmaceutical Management Systems, Pharmaceutical Materials, Pharmaceutical Bio-processing, Bioelectronics, Critical Infrastructure Systems, and Power and Energy Systems. MS curriculum was revised college-wide to produce workforce ready graduates from each program. Revised curriculum included concentration in technical areas as well as soft skills (communication, management, entrepreneurship, accounting, etc.)

Development: Developed College priorities for the upcoming Capital Campaign. Development office was reorganized to facilitate fundraising consistent with the goals of the College and to enhance alumni participation. Three gifts were secured: \$1M gift (September 2007) for student scholarships; \$1M gift (December 2008) for the creation of an Endowed Professorship in Innovation; and a \$0.25M gift (2012) for the development of Innovation Workspace. Played significant role in current fundraising Campaign at NJIT. A large number of alums were mobilized through personal visits and organization of an annual networking event.

Globalization: Delivery of MS in Engineering Management in partnership with Beijing University of Technology in Beijing, China. Agreements for student exchange were developed with four major universities in India. A three-university undergraduate program in Industrial Engineering involving NCE, a Spanish (Valencia), and an Italian (Parma) university was created.

Interim Dean, College of Engineering, University of South Florida, June 2006 – May 2007.

Research: Orchestrated the development of two large proposals for interdisciplinary Center of Excellence (~ \$10M each) to the State of Florida by facilitating collaborations between Colleges of Engineering, Arts and Sciences, and Medicine. One of these proposals was funded

Faculty Recruitment: Recruited the first member of the National Academy of Engineering (NAE) at USF.

Global Connections: Created a dual Ph.D. program in Power Engineering between USF College of Engineering and University Polytechnic Valencia in Spain.

Interdisciplinary Collaborations: Initiated discussions on the creation of an interdisciplinary Institute for Advanced Materials jointly between Colleges of Engineering and Arts and Sciences to bring complementary researchers under one umbrella. Initiated and led discussions for the creation of a new Department of Biomedical Engineering jointly between the College of Engineering and the College of Medicine.

Strategic Alliances: Initiated discussions with several key local industries and institutions to enhance research collaborations including Shriner's Hospitals; Blackbird Technologies, Inc.; Special Operations Command (SOCOM). Coordinated and prioritized congressional and state legislature requests from the College of Engineering to reflect niche areas of growth for the College and local opportunities for economic development. Regular visits by personnel from funding agencies were initiated for interactions with faculty on emerging funding opportunities and on developing successful proposals.

Development: Secured a development professorship (\$50K) and a \$100K gift.

Chairman, Department of Civil and Environmental Engineering, University of South Florida, December 2002 – May 2006.

Strategic: Developed strategic directions for the Department to aid in hiring new faculty and defining Department programs. Formed Executive Advisory Board to assist with review of Department activities and advise on initiatives to meet its objectives. Led the development and preparation of the Department self-study reports and documents for the successful ABET accreditation visit in September 2007.

Program Development: Restructured the Department and identified new research concentration areas based on regional needs and national demands. Established a strong program in Environmental Engineering with focus on water related research integrating water resources and environmental issues to provide comprehensive engineering solutions. Proposed, designed, and received approval for a new 9-month professional Masters of Engineering in Civil Engineering that included business, management, and leadership exposure. Partnerships were developed with other colleges (School of Public Health, Environmental Science and Policy, Geology) to deliver joint interdisciplinary programs and research directions. Delivery of online courses and certificates in the Transportation and Environmental areas was initiated.

Faculty Recruitment, Diversity, and Growth: Recruited seven faculty members into the Department from top research institutions in the country. Increased faculty diversity by hiring faculty from groups underrepresented in engineering (two females, one African-American, one Hispanic faculty). Enhanced productivity in research was facilitated by assigning a course load of 3 courses per year to the faculty. Developed and implemented a

well structured Annual Faculty Performance Evaluation procedure with emphasis on faculty improvement and assistance that included a self-assessment by the faculty.

Research: Enhanced research portfolio of the Department. NASA-USF National Center for Runway Friction was established with \$1.8M funding from NASA. The Ph.D. program grew from 9 Ph.D. students to 62 Ph.D. students. Encouraged faculty to pursue federally funded research opportunities resulting in increased number of grants and funding. *Research expenditures (per faculty) increased by 39 percent.* Facilitated growth of articles published in archival journals. *Refereed publications grew by 45 percent.*

Student Involvement: Established CEEGSA, the Graduate Student Association of the Department of Civil and Environmental Engineering. CEEGSA advised the Chairman on matters related to graduate student experiences in the Department. Graduate Student Handbook was for the Department. The handbook includes information for graduate students on all aspects of graduate education in the Department. Increased involvement of undergraduate students in the Department by holding open discussions in student ‘focus groups’ once every 4-6 weeks on matters related to teaching and curriculum effectiveness.

Outreach: Created Department website to better advertise programs and accomplishments. Department and program brochures were developed for enhancing the brand recognition in Civil engineering circles. The first Department Newsletter was published to communicate Department activities to alumni, local industry, and the civil engineering community.

Strategic Alliances: Breakfast meetings with industry leaders in the local area in various sub-disciplines of civil engineering to solicit advice to better prepare students for industry jobs upon graduation. Alumni participation in student activities was increased, including in ASCE student chapter activities, bringing industry perspective to capstone classes, and teaching topics of current industry interest. Industry Affiliates Program was established for enhanced industry interaction and input in Department research activities.

Development: Created two of fixed-term development professorships, each carrying \$50,000.

Professor, Biomedical Engineering Program, University of South Florida (2004 – 2007)

Program Director, Mechanics and Materials Program, Division of Civil and Mechanical Systems, National Science Foundation (1996 – 1998)

Professor (with tenure), Department of Civil and Environmental Engineering, Carnegie Mellon University (1995 – 2003)

Professor (by courtesy), Department of Mechanical Engineering, Carnegie Mellon University (1998 – 2003)

Associate Professor, Department of Civil and Environmental Engineering, Carnegie Mellon University (1992 – 1995)

Assistant Professor, Department of Civil and Environmental Engineering, Carnegie Mellon University (1989 – 1992)

Assistant Professor, Department of Mechanical Engineering, Worcester Polytechnic Institute (1986 – 1989)

Research Associate, Naval Surface Warfare Center, Indian Head, MD (Summer 2002)

Research Engineer, Sandia National Laboratories, Albuquerque, NM (Summer 2001)

Research Fellow, Ford Motor Company, Dearborn, MI (Summer 1999)

Consultant, Mechanics and Materials Program, Civil and Mechanical Systems (CMS) Division (1998-1999)

Research Engineer, Musculoskeletal Research Center, University of Pittsburgh Medical Center, Pittsburgh, PA (Summer 1994)

Research Engineer, Metals and Ceramics Division, Oak Ridge National Laboratories, Oak Ridge, TN (Summer 1993)

Visiting Engineer, Division of Engineering Computations, Mercedes Benz AG, Stuttgart (Jan.-Aug, 1992)

Summer Research Fellow, Structures and Materials, NASA Lewis Research Center (Summer 1990 and Summer 1991)

Visiting Professor, Department of Mechanical Engineering, University of Arizona Tuscon, AZ (Summer 1988)

Visiting Engineer, Hibbitt, Karlsson, and Sorensen, Inc., Pawtucket, RI (Summer 1987)

HONORS AND AWARDS

Fellow of American Association for Advancement of Science

Fellow of American Society of Mechanical Engineers

Fellow of American Society of Civil Engineers

Associate Fellow of American Institute of Aeronautics and Astronautics

Achievement Award, Society of Indian American Engineers and Architects, 2010

Outstanding Administrator Award, NJIT Student Senate, 2009

Certificate of Appreciation (in support of your continued support and valuable contributions to The Society of Women Engineers and the NJIT community), NJIT Society of Women Engineers, 2009, 2010

HOST/SHPE's Educator of the Year (in recognition of support and promoting HOST/SHPE and the Hispanic community), NJIT Hispanic Organization of Students in Technology – Society of Hispanic Professional Engineers (HOST-SHPE), 2009

Certificate of Appreciation, Alfred P. Sloan Foundation, 2007

Recipient of **Leighton and Margaret Orr Award** for Best Paper, ASME Materials Division, 2004

Listed in **Who's Who in America**, 57th Edition, 2002.

Recipient of **Richard Teare Award** for Excellence in Engineering Education, Carnegie Mellon University, 1996

Outstanding Professor of the Year Award, ASCE Pittsburgh Section, 1994

Recipient of **George Tallman Ladd Research Award**, Carnegie Mellon University, 1990

Presidential Young Investigator Award, National Science Foundation, 1990

Recipient of **Ralph R. Teator Award**, Society of Automotive Engineers, 1988

Recipient of **Admiral Ralph Earle Medal**, Worcester Engineering Society, 1987

UNIVERSITY SERVICE ACTIVITIES

Co-chair, University Task Force for Retention and Graduation, New Jersey Institute of Technology, 2012 – 2012.

Mentor, Women's Volleyball Team, 2012 – 2014.

Member, Strategy Committee, United Council of Academics at NJIT AFT, New Jersey Institute of Technology, 2010 – 2012.

Member, Committee on Department and Program Assessment, New Jersey Institute of Technology, 2010 – 2012.

Chairman, Steering Committee, NCE Strategic Planning, Newark College of Engineering, New Jersey Institute of Technology, 2009 – 2012.

Member, University Strategic Planning Committee, New Jersey Institute of Technology, 2009 – 2012.

Member, Advisory Board of the Dorman Honors College, New Jersey Institute of Technology, 2008 – 2012.

Member, University Athletics Oversight Committee, New Jersey Institute of Technology, 2008 – 2012.

Member, Dean's Council, New Jersey Institute of Technology, 2007 – 2012.

Member, Collective Bargaining Agreement Negotiation Team, New Jersey Institute of Technology, 2007 – 2009.

President, Board of Visitors, Newark College of Engineering, New Jersey Institute of Technology, 2007 – 2012.

Member, Council of Deans, University of South Florida, 2006 - 2007

Member, Academic Affairs Planning Group, University of South Florida, 2006 - 2007

Member, Planning Team for Strategic Goals for the University of South Florida, 2006

Member, Committee for a Constitution for the University of South Florida, 2006

Member, Committee for Selection of USF Presidential Doctoral Fellowship Awardees, 2006

Search Committee, Associate Provost and Dean of Graduate Studies, University of South Florida, 2005 and 2006

Faculty Representative, Title IX Committee, University of South Florida, 2005 – 2007

Chairman, Graduate Studies Vision Taskforce, University of South Florida, 2004

Executive Council, College of Engineering, 2001 - 2007

Trustee (ex-officio), Carnegie Mellon University, 2002 – 2003

Educational Affairs and Enrollment Committee, 2002 – 2003

Chair, Faculty Senate, 2002 – 2003.

Vice-Chair, Faculty Senate, 2002

Faculty Affairs Committee, 2001 – 2002

Executive Committee of the Faculty Senate, 2001 – 2003

University Education Council, 2001 – 2003 also 1994-96

Coordinator, Graduate Admissions, 2000 – 2002 also 1990-1993

Faculty Senate, 1993 – 1996

Chairperson, Graduate Curriculum Committee, 1999 – 2002

Faculty Search Committees, 1992, 1999

Promotion and Tenure Committees 1996, 1999, 2001.

Chair, Promotion and Tenure subcommittee, 2001

Foreign Scholars Advisory Committee, 1994

Educational Facilities Committee, 1993 – 1996

Faculty Advisor, ASCE Student Chapter

EDITORIAL ACTIVITIES

Editorial Board, *International Journal for Numerical Methods in Engineering*, 1995 – present.

Associate Editor, *AIAA Journal*, 1997 – present.

Editorial Board, *Engineering with Computers*, 1998 – present

Editorial Board, *International Journal for Computational Civil and Structural Engineering*, 1998 – present.

Guest Editor, Special Issue of the *International Journal of Computers and Structures*.

Associate Editor, Computational Mechanics, *ASCE Journal of Engineering Mechanics*, 1996– 1999.

Publications Committee, *ASCE Journal of Aerospace Engineering*, 1998 – 1993.

PROFESSIONAL SERVICE ACTIVITIES

Session Co-chair (with David Garza-Salazar and Uriel Cukierman). Session on Curricular Innovation at Global Engineering Deans Council, Peking University, Beijing, China, October 20-22, 2011.

Secretary, Sigma Xi, Tampa Bay, 2005 – 2006

Member, Board of Directors, ASCE West Coast Branch, 2006 - 2007

Member, Committee on Computing in Applied Mechanics, ASME, 1994 – 2003

Member, Technical Committee (TC) on Structures, AIAA, 1994 – 2002

Chair, Committee on Computational Mechanics, ASCE Engineering Mechanics Division, 1996-1998

Chair, Subcommittee on ASCE/AIAA Conference Liaison, 1992-1996

Secretary, ASME Worcester, MA section, 1988 -1989

Panelist, Proposal review for several agencies including the National Science Foundation, Air Force, Army, ORNL, and Western Pennsylvania Advanced Technology Center.

Reviewer for technical articles for over 20 archival journals

Organized several symposia in conferences of professional societies including the AIAA, ASME, and USACM

PROFESSIONAL SOCIETY AFFILIATIONS

Member, American Association for Advancement of Science, American Institute of Aeronautics and Astronautics, American Society of Civil Engineers, American Society of Mechanical Engineers, American Society of Engineering Education, US Association for Computational Mechanics, Sigma Xi Honors Society

GRANTS AND CONTRACTS

Principal Investigator

TELUS for Transit; US Department of Transportation, Federal Transit Authority; Budget \$1,530,000; Duration 36 months; start date January 2008; Principal Investigator S. Saigal

National Center for Runway Friction. NASA Langley Research Center, Langley, VA; Budget \$1,800,000; Duration 24 months; start date August 2006; Principal Investigator S. Saigal (contract turned over to a colleague at USF upon leaving the institution and joining NJIT).

Hybrid Particle Methods for High Velocity Dynamic Events; Budget \$240,000; Duration 36 months; start date January 1, 2006; Principal Investigator S. Saigal

Treatment for Facet Joint in the Spine. Orthopaedic Development Corporation, Clearwater, FL; Budget \$40,000; Duration 12 months; start date August 2004; Principal Investigator S. Saigal.

Reverse Shoulder Prosthesis. Florida Orthopaedic Institute, Tampa, FL; Budget \$40,000; Duration 12 months; start date July 1, 2003; Principal Investigator S. Saigal.

New Meshless/Particle Methods for Naval Structures and Weapon Systems. Office of Naval Research; Budget \$225,000; Duration 36 months; start date March 1, 2003; Principal Investigator S. Saigal

Algorithms for STL Data Cleanup and Manipulation. Sandia National Laboratory, Albuquerque, NM. Budget \$140,500; Duration 20 months; start date February 1, 2003; Principal Investigator S. Saigal

Algorithms for Determining Medial Surfaces. Sandia National Laboratory, Albuquerque, NM; Budget \$185,000; Duration 16 months; start date June 1, 2001; Principal Investigator S. Saigal

Topology Optimization for MEMS. Pennsylvania Infrastructure Technology Alliance; Budget \$41,400; Duration 12 months; start date November 1, 1999; Principal Investigator S. Saigal.

Analytical-Experimental Approach to Verified Cohesive Fracture Models in Engineering Applications. National Science Foundation; Budget \$210,055; Duration 36 months; start date September 1, 1999; Principal Investigator S. Saigal

Hexahedral and Tetrahedral Finite Elements in Structural Analysis. Sandia National Laboratory, Albuquerque, NM; Budget \$99,000; Duration 12 months; start date June 1, 1999; Principal Investigator S. Saigal

Cohesive Finite Elements for Physical Simulations. Sandia National Laboratories; Budget \$200,000; Duration 36 months; start date September 1, 1999; Principal Investigator S. Saigal

Safety and Crashworthiness Simulations. Pennsylvania Infrastructure Technology Alliance; Budget \$52,222; Duration 12 months; start date September 1, 1998; Principal Investigator S. Saigal.

Cohesive Zone Models for Polymeric Fracture. E.I. NeMours DuPont Company; Budget \$20,000; Duration 24 months; start date August 1, 1998; Principal Investigator S. Saigal

Studies on Hexahedral vs. Tetrahedral Finite Element Meshes; ANSYS, Inc.; Budget \$21,000; Duration 12 months; start date January 1, 1998; Principal Investigator S. Saigal.

Quality Metrics for 2D and 3D Finite Element Meshing; ANSYS, Inc.; Budget \$35,000; Duration 12 months; start date August 1, 1996; Principal Investigator S. Saigal

VRML and HTML for Finite Elements Models Animation; ANSYS, Inc.; Budget \$35,000; Duration 12 months; start date August 1, 1996; Principal Investigator S. Saigal

Finite Element Crash Simulations of Illinois 2399-1 Steel Post and Beam Bridge Railing; Federal Highway Administration; Budget \$20,000; Duration 12 months; start date January 1, 1995; Principal Investigator S. Saigal.

p-Version Shell Finite Elements for Fast, Accurate Analysis of Thin Welded Structures; Martin Marietta Energy Systems/Oak Ridge National Laboratories, Oak Ridge, TN; Budget \$25,000; Duration 12 months; start date January 1, 1994; Principal Investigator S. Saigal.

Investigation of Contact Stresses in the Acetabular Polyethylene Insert; University Orthopaedics, Inc.; Budget \$62,000; Duration 24 months; start date September 1, 1993; Principal Investigator S. Saigal.

Finite Element Software for Soil Consolidation; Swanson Analysis Systems, Inc.; Budget \$92,000; Duration 24 months; start date September 1, 1993; Principal Investigator S. Saigal

Unit/Truss/Continuum Scales Deformation Modeling of Particulate Materials; ALCOA Foundation; Budget \$15,000; Duration 24 months; start date July 1, 1993; Principal Investigator S. Saigal.

Extension of the Integrated Force Method for Membrane and Bending Coupled Problems; NASA Lewis Research Center, Cleveland, Ohio; Budget \$32,082; Duration 12 months; start date January 1, 1993; Principal Investigator S. Saigal.

Software for the Dynamic Simulation of Large Full-Vehicle Models; Swanson Analysis Systems, Inc.; Budget \$35,000; Duration 12 months; start date September 1, 1992; Principal Investigator S. Saigal.

CAE Software for Electromagnetic Devices and Processes; Swanson Analysis Systems, Inc. and Ben Franklin Technology Center; Budget \$82,500; Duration 12 months; start date September 1, 1991; Principal Investigator S. Saigal.

1991, 1992, 1993 Research Experiences for Undergraduates; National Science Foundation; Budget \$13,000; Duration 3 months each year ; start date May 1, 1991, 1992, 1993; Principal Investigator S. Saigal.

Lightweight Beam Sections for Manufactured Housing; Ben Franklin Technology Center; Budget \$55,400; Duration 12 months; start date September 1, 1990; Principal Investigator S. Saigal.

Research into the Integration of Boundary and Finite Elements; Swanson Analysis Systems, Inc.; Budget \$50,000; Duration 12 months; start date September 1, 1990; Principal Investigator S. Saigal.

Semi-analytical Univariate Perturbation and Implicit Differentiation for Structural Sensitivities of 3-D Solids Using Boundary Elements, The National Science Foundation, \$60,000; Duration 24 months; start date August 1, 1987. Principal Investigator: S. Saigal (Research Initiation Grant).

Boundary Elements Research in Solid Mechanics; National Science Foundation, Presidential Young Investigator; Budget \$325,000; Duration 60 months; start date September 1, 1990; Principal Investigator S. Saigal.

Finite Strain Shell Formulations, HKS Inc., Providence, RI, \$10,000; Duration 3 months; start date May 15, 1987. Principal Investigator: S. Saigal.

Three Dimensional Structural Shape Optimization: Research Project Initiation and Preliminaries, WPI Research and Development Council, \$5,000; Duration 12 months; start date August 1, 1987. Principal Investigator: S. Saigal.

Furnace Design Program for Optimal Temperature Profile on Dies for Ceramic Tile Manufacture, Norton Company, Worcester, MA, \$29,186; Duration 12 months; start date January 1, 1988. Principal Investigator: S. Saigal (Co-Principal Investigator: H.T. Grandin, Jr.)

Co-Principal Investigator

Design for Deflection Control vs. Use of Specified Span to Depth Ratio Limitations; New Jersey Department of Transportation; Budget \$200,000; Duration 24 months; start date May 2009; Principal Investigators: M. Ala Saadeghvaziri, S. Saigal, Ali Khan.

Structural Analysis in MEMS Design and Reliability, PITA – Pennsylvania Initiative for Technology Advancement, \$37,890; Duration 12 months; start date January 1, 2001. Principal Investigators: A. Acharya, S. Saigal, G. Fedder

Microstructure Based Plasticity for Advanced Materials Development, PITA – Pennsylvania Initiative for Technology Advancement, \$37,890; Duration 12 months; start date January 1, 2001. Principal Investigators: A. Acharya, S. Saigal, H.R. Piehler

Graduate Research Traineeship: Integrating Science, Technology, and Management in Global Civil Infrastructure Systems, The National Science Foundation, \$562,500; Duration 60 months; start date September 1, 1996; Principal Investigators: S. McNeil, S. Saigal, H. Koutsopoulos.

Formulation of Boundary Element Substructuring, Reduced Design Sensitivity Analysis, and Re-analysis for Efficient Optimal Shape Configuration, The National Science Foundation, \$171,000; Duration 36 months; start date September 1, 1988. Principal Investigators: J.H. Kane, S. Saigal and R.H. Gallagher.

Structural Shape Optimization of Solid Objects Using a Boundary Element Formulation, United Technologies Corporation, E. Hartford, CT, \$80,000; and Electric Boat Division of General Dynamics, New London, CT, \$76,000; Duration 24 months; start date August 1, 1987.. Principal Investigators: S. Saigal and J.H. Kane.

Faculty Associate

Computer Aided Simultaneous Engineering; General Motors Research Corporation; Budget; \$38,000; start date September 1, 1989; faculty associate; Principal Investigator: S. Talukdar.

PUBLICATIONS

Books

1. Boreasi, A.P., K.P. Chong and S. Saigal. *Approximate Solution Methods in Engineering Mechanics*, John Wiley and Sons, New York, 2002.
2. *Modelling and Simulation Based Life Cycle Engineering*. Spon Press, London, 2001. K.P. Chong, S. Thynell, H. Morgan and S. Saigal (Editors)
3. *Advances in Unstructured Mesh Generation*. American Society of Mechanical Engineers. ASME AMD Vol. 220, New York, 1997. S. Canann and S. Saigal (Editors).
4. *Inverse Problems in Mechanics*. American Society of Mechanical Engineers. ASME AMD Vol. 186, New York, 1994. S. Saigal and L. Olson (Editors).
5. *Sensitivity Analysis and Shape Optimization with Numerical Methods*. American Society of Mechanical Engineers. ASME AMD Vol. 115, New York, 1990. S. Saigal and S. Mukherjee (Editors).

Patents

US Patent on Method of Making an Improved Hot Rolled I-Beam and Associated Product. U.S. Patent No. 5,823,042. October 20, 1998. With C.A. Snyder, M.A. Karczewski, and K.W. Shurskis.

Refereed Journal Publications

2001-present

1. Li, K., and S. Saigal. Micromechanical modeling of stress transfer in carbon nanotube reinforced polymer composites. *Materials Science and Engineering A* 457 (1-2), pp. 44-57, 2007.
2. Khan, S., S. Bandyopadhyay, A.R. Ganguly, S. Saigal, D.J. Erickson III, V. Protopopescu, G. Ostrouchov. Relative performance of mutual information estimation methods for quantifying the dependence among short and noisy data. *Physical Review E - Statistical, Nonlinear, and Soft Matter Physics* 76 (2), art. no. 026209, 2007.
3. Muralidhar, S., and S. Saigal. Crack Bridging in Polymer Nanocomposites. *ASCE Journal of Engineering Mechanics*. Vol. 133 (8), pp. 911-918, August 2007.

4. Muralidhar, S., S. Saigal, A. Jagota, and S.J. Bennison. Scaling of Fracture Energy in Tensile Debonding of Viscoelastic Films. *Journal of Applied Physics*. Vol. 101(9), Art. no. 093504, 2007.
5. Khan, S., Ganguly, A.R., Bandyopadhyay, S., Saigal, S, Erickson, D.J. III, Protopopescu, V., Ostrouchov, G. Nonlinear Statistics Reveal Stronger Ties Between ENSO and the Tropical Hydrological Cycle. *Geophysical Research Letters*. Vol. 33(24), Art. No. L24402, Dec. 20, 2006
6. Moore, R.H. and S. Saigal. Eliminating Slivers in Finite Elements. *CMES - Computer Modeling in Engineering & Sciences*. Vol. 7(3), pp. 283-291, Mar. 2005.
7. Khan, S., A.R. Ganguly, and S. Saigal. Detection and predictive modeling of chaos in finite hydrological time series. *Nonlinear Processes in Geophysics*, Vol. 12, pp. 41-53, 2005.
8. Huang, H., S. Saigal, and C.T. Dyka. Moving Least Squares Interpolants in the Hybrid Particle Method. *International Journal for Numerical Methods in Engineering*. Vol. 63(4), pp. 528-547, May 2005.
9. Huang, H., S. Saigal and C.T. Dyka. Finite Elements Based Boundary Treatment in the Hybrid Particle Methods. *AIAA Journal*. Vol. 43(7), pp. 1626-1628, July 2005.
10. Tang, H., A. Acharya, and S. Saigal. Directional Dependence of Crack growth Along the Interface of a Bicrystal with Symmetric Tilt Boundary in the Presence of Gradient Effects. *Mechanics of Materials*. Vo. 37(5), pp. 593-606, May 2005.
11. Dyka, C.T., and S. Saigal. On the Development of a Hybrid Particle Method Using the Differential Formulation. *International Journal for Computational Methods in Engineering Science and Mechanics*. Vol. 6(1), pp. 21-29, Jan-Mar. 2005.
12. White, D.R., Saigal, S., and Owen, S.J. Meshing complexity: predicting meshing difficulty for single part CAD models. *Engineering with Computers*, Vol. 21, pp. 76-90, 2005
13. Khan, S., A.R. Ganguly, and S. Saigal. Detection and predictive modeling of chaos in finite hydrological time series. *Nonlinear Processes in Geophysics*. Vol. 12, pp. 41-53, 2005.
14. Acharya, A., H. Tang, S. Saigal, and J.L. Bassani. On Boundary Conditions and Vertex Localization in Lower-Order Gradient Plasticity. *Journal of Mechanics and Physics of Solids*. Vol. 52(8), pp. 1793-1826, Aug. 2004.

15. Tang, H., Y.S. Choi, A. Acharya, and S. Saigal. Effects of Lattice Incompatibility Induced Hardening on the Fracture Behavior of Ductile Single Crystals. *Journal of Mechanics and Physics of Solids*. Vol. 52 (12), pp. 2841-2867, Dec. 2004.
16. Huang, H., C.T. Dyka and S. Saigal. Hybrid Particle Methods for Frictionless Impact-Contact Problems. *International Journal for Numerical Methods in Engineering*. Vol. 61 (13), pp. 2250-2272, Dec. 2004.
17. White, D.R. and S. Saigal. CCSweep: Automatic Decomposition of Multi-Sweep Volumes. *Engineering with Computers*. Vol. 20 (3), pp. 222-236, 2004.
18. Hill, J.C., S.J. Bennison, P.A. Klein, A. Jagota, and S. Saigal. Co-planar Crack Interaction in Cleaved Mica. *International Journal of Fracture*. Vol. 119 (4-2), pp. 365-386, 2003.
19. White, D.R., S. Saigal, and S.J. Owen. An Imprint and Merge Algorithm Incorporating Geometric Tolerances for Conformal Meshing of Misaligned Assemblies. *International Journal for Numerical Methods in Engineering*. Vol. 59 (14), pp. 1839-1860, April 2004.
20. Muralidhar, S., S.J. Bennison, A. Jagota and S. Saigal. Mechanical Response of Cracked Laminated Plates. *Acta Materialia*, 50(18) pp.4477-4490 2002.
21. Jagota, A., Rahulkumar, P., S. Saigal. Free Oscillations of Stable Griffith cracks. *International Journal of Fracture*, Vol. 116, Issue 2, pp. 103-120, 2002.
22. Owen, S.J. and S. Saigal. H-Morph: An Indirect Approach to Advancing Front Hex Meshing. *International Journal for Numerical Methods in Engineering*. Vol. 49, No. 1, pp. 289-312, 2001.
23. Owen, S.J. and S. Saigal. Formation of Pyramid Elements for Hexahedra to Tetrahedra Transitions. *Computer Methods in Applied Mechanics and Engineering*. Vol. 190, No. 134, pp. 4505-4518, 2001.
24. Salem, A.Z.I., S. Saigal, and S.A. Canann. Mid-node Admissible Spaces for 3D Quadratic Tetrahedral Elements. *Engineering with Computers*. Vol. 17, pp. 39-54, 2001.
25. Salem, A.Z.I., S. Canann, and S.Saigal. Midnode Admissible Spaces for Quadratic Triangular 2D Finite Elements with One Edge Curved. *International Journal for Numerical Methods in Engineering*. Vol. 50, No. 1, pp. 181-198, 2001.
26. Salem, A.Z.I., S.A. Canann, and S. Saigal. Mid-node Admissible Spaces for Quadratic Triangular Arbitrarily Curved 2D Finite Elements. *International Journal for Numerical Methods in Engineering*. Vol. 50, No. 2, pp. 253-272, 2001.

1996-2000

27. Rahul Kumar, P., A. Jagota, S.J. Bennison, and S. Saigal. Cohesive Element Modeling of Viscoelastic Fracture: Application to Peel Testing. *International Journal of Solids and Structures*. Vol. 37, No. 13, pp. 1873-1897, 2000.
28. Saigal, S. and W. Barry. A Slices Based Element Free Galerkin Formulation. *Computational Mechanics*, Vol. 25, Nos. 2-3, pp. 220-229, 2000.
29. Muralidhar, S., A. Jagota, S.J. Bennison, and S. Saigal. Mechanical Behavior in Tension of Cracked Glass Bridged by an Elastomeric Ligament. *Acta Materialia*, Vol. 48, pp. 4577-4588, 2000.
30. Owen, S.J., and S. Saigal. Surface Mesh Sizing Control. *International Journal for Numerical Methods in Engineering*. Vol. 47, pp. 497-511, 2000.
31. Rahul Kumar, P., A. Jagota, S.J. Bennison, and S. Saigal. Interfacial failures in compressive shear strength tests of glass/polymer laminates. *International Journal of Solids and Structures*. Vol. 37, Nos. 48-50, pp. 7281-7306, 2000.
32. Yang, H.T.Y., S. Saigal, A. Masud, and R.K. Kapania. A survey of recent shell finite elements. *International Journal for Numerical Methods in Engineering*. Vol. 47, pp. 101-127, 2000.
33. Rahul-Kumar, P., A. Jagota, S.J. Bennison, S. Saigal, and S. Muralidhar. Polymer Interfacial Fracture Simulations Using Cohesive Elements. *Acta Materialia*. Vol. 47 [15/16] p. 4161, 1999.
34. Owen, S.J., M.L. Staten, S.A. Canann, and S. Saigal. Q-Morph: An Indirect Approach to Advancing Front Quad Meshing. *International Journal for Numerical Methods in Engineering*. Vol. 44, No. 9, pp. 1317-1340, 1999.
35. Barry, W. and S. Saigal. A Three-dimensional Element Free Galerkin Elastic and Elastoplastic Formulation. *International Journal for Numerical Methods in Engineering*. Vol. 46, pp. 671-693, 1999.
36. Xu, Y. and S. Saigal. An Element Free Galerkin Analysis of Steady Dynamic Growth of a Mode I Crack in Elastic-Plastic Materials. *International Journal of Solids and Structures*. Vol. 36, pp. 1045-1079, 1999.
37. Sun, S., B.L. Adams, C. Shet, S. Saigal, and W. King. Mesoscale Investigation of the Deformation Field of an Aluminum Bicrystal. *Scripta Materialia*. Vol. 39, pp. 501-512, 1998.

38. Xu, Y. and S. Saigal. An Element Free Galerkin Formulation for Stable Crack Growth in Elastic Solids. *Computer Methods in Applied Mechanics and Engineering*. Vol. 154, pp. 331-343, 1998.
39. Xu, Y. and S. Saigal. Element Free Galerkin Study of Steady Quasi-Static Crack Growth in Plane Strain Tension in Elastic-Plastic Materials. *Computational Mechanics*. Vol. 21, pp. 276-282, 1998.
40. Ghosh, R.S., S. Saigal, and D.A. Dzombak. Assessment of *in situ* solvent extraction with interrupted pumping for remediation of subsurface coal tar contamination, *Water Environment Research*, Vol. 69, No. 3, pp. 295-305, May/June 1997.
41. Kaljevic, I., and S. Saigal. An Improved Element Free Galerkin Formulation. *International Journal for Numerical Methods in Engineering*, Vol. 40, pp. 2953-2974, 1997.
42. Li, H., S. Saigal, and P.T. Wang. Contact interactions between spherical powder particles undergoing large deformations during packing. *Acta Metallurgica et Materialia*, 1996.
43. Rahulkumar, P., S. Saigal, and S.M. Yunus. Singular p-Version Finite Elements for Stress Intensity Factor Computations. *International Journal for Numerical Methods in Engineering*, Vol. 40, pp. 1091-1114, 1997
44. Saigal, S., and I. Kaljevic. Stochastic BEM - Random Excitations and Transient Dynamic Analysis. *ASCE Journal of Engineering Mechanics*. Vol. 122, No. 4, pp. 342-349, 1996.
45. Patnaik, S.N., I. Kaljevic, D.A. Hopkins, and S. Saigal. Completed Beltrami-Michell Formulation for Analyzing Mixed Boundary Value Problems in Elasticity. *AIAA Journal*. Vol. 34, No. 1, pp. 143-148, 1996.

1991-1995

46. Simunovic, S., and S. Saigal. A Linear Programming Formulation for Contact Analysis. *International Journal for Numerical Methods in Engineering*, Vol. 38, No. 6, 1995, pp. 2703-2726.
47. Aithal, R. and S. Saigal. Shape Sensitivity Analysis in Thermal Problems using BEM. *Engineering Analysis with Boundary Elements*, Vol. 15, 1995, pp. 115-120.
48. Simunovic, S. and S. Saigal. Treatment of under-constrained Objects in Contact Analysis. *International Journal for Engineering Analysis and Design*, Vol. 2, 1995, pp. 141-156.

49. Simunovic, S., and S. Saigal. Quadratic Programming Contact Formulation for Elastic Bodies Using Boundary Element Method. *AIAA Journal*, Vol. 33, No. 2, 1995, pp. 325-331.
50. Tetambe, R.P., S.M. Yunus, C. Rajakumar, and S. Saigal. Examination of flux projection-type error estimators in nonlinear finite element analysis. *Computers and Structures*, Vol. 54, No. 54, 1995, pp. 641-654.
51. Rahulkumar, P., T.H. Broome, and S. Saigal. Dynamical Systems with Rigid-Body Degree-of-Freedom Oscillators. *ASCE Journal of Engineering Mechanics*, Vol. 121, No. 3, 1995, pp. 487-491.
52. Kaljevic, I., and S. Saigal. Stochastic Boundary Elements for Two-Dimensional Potential Flow in Homogeneous Domains. *International Journal of Solids and Structures*, Vol. 32, No. 13, 1995, pp. 1873-1892.
53. Kaljevic, I., and S. Saigal. Stochastic Boundary Elements for Two-Dimensional Potential Flow in Nonhomogeneous Domains. *Computer Methods in Applied Mechanics and Engineering*, Vol. 121, 1995, pp. 211-230.
54. Bezerra, L.M., and S. Saigal. Inverse Boundary Traction Reconstruction with the BEM. *International Journal of Solids and Structures*. Vol. 32, No. 10, 1995, pp. 1417-1431.
55. Li, H., S. Saigal, P.T. Wang, and H.R. Piehler. A Critical Evaluation and Extension of Internal State Variables Constitutive Models. *International Journal of Plasticity*, Vol. 11, No. 4, 1995, pp. 331-345.
56. Simunovic, S. and S. Saigal. Contact Surface Optimization using Boundary Element Method. *Computers and Structures*, Vol. 56, No. 5, 1995, pp. 745-750.
57. Kaljevic, I. And S. Saigal. Analysis of Symmetric Domains in Advanced Applications with the Boundary Element Method. *International Journal for Numerical Methods in Engineering*, Vol. 38, 1995, pp. 2373-2388.
58. Nicolaou, P.D., H.R. Piehler, and S. Saigal. Experimental and Finite Element Analytical Guidelines for Fabricating Continuous Fiber (SCS-6) Metal Matrix (Ti-6Al-4V) Composites via the Foil/Fiber/Foil Technique. *Journal of Composite Materials*, Vol. 28, No. 17, December 1994, pp. 1694-1722.
59. Li, H., S. Saigal, A. Ali, and T.P. Pawlak. Mapped Infinite Elements for 3-D Vector Potential Magnetic Problems. *International Journal for Numerical Methods in Engineering*, Vol. 37(2), January 1994, pp. 343-356.

60. Sterner, S.C., S. Saigal, W. Kistler, and D.E. Dietrich. A Unified Numerical Approach for the Analysis of Rotating Disks Including Turbine Rotors. *International Journal of Solids and Structures*, Vol. 31, No. 2, January 1994, pp. 269-278.
61. Simunovic, S. and S. Saigal. Frictional Contact Formulation Using Quadratic Programming. *Computational Mechanics*, Vol. 15, No. 2, November 1994, pp. 173-187.
62. Simunovic, S., and S. Saigal, "Frictionless Rigid - Elastic Contact by BEM Using Quadratic Programming", *ASCE Journal of Engineering Mechanics*, Vol. 118, No. 9, Sept. 1992, pp. 1876-1881. Discussion by C. Alessandri and A. Tralli and Closure by authors, Vol. 119, No. 12, Dec. 1993, pp. 2538-2540.
63. Kaljevic, I., and S. Saigal. Stochastic Boundary Elements in Elastostatics. *Computer Methods in Applied Mechanics and Engineering*, Vol. 109, 1993, pp. 259-280.
64. Bezerra, L.M., and S. Saigal, "A Boundary Element Formulation for the Inverse Elastostatics Problem (IESP) of Flaw Detection," *International Journal for Numerical Methods in Engineering*, Vol. 36, 1993, pp. 2189-2202.
65. Kaljevic, I., S. Saigal, and T.H. Broome, Jr.. Dynamical Analysis of a General Mass-Spring Arrangement in Beam Systems. *Journal of Sound and Vibration*. Vol. 163, 1993, pp. 67-81.
66. Kaljevic, I., S. Saigal, and A. Ali. An Infinite Boundary Element Formulation for Three Dimensional Potential Problems. *International Journal for Numerical Methods in Engineering*. Vol. 35, 1992, pp. 2079-2100.
67. Zeng, X., and S. Saigal, "An Inverse Formulation with Boundary Elements," *ASME Journal of Applied Mechanics*, Vol. 54, No. 4, December 1992, pp. 835-840.
68. Meric, R.A., and S. Saigal. Load Sensitivity Analyses of Elastic Structures by Differential and Boundary Integral Equation Formulations. *Structural Optimization*, Vol. 3, 1991, pp. 240-246.
69. Zeng, X., and S. Saigal. A Fourier Expansion Based Particular Integral Approach for Non-Boundary Loadings in Boundary Element Method. *Communications in Applied Numerical Methods*, Vol. 7, 1991, pp. 453-464.
70. Meric, R.A., and S. Saigal. Shape Sensitivity Analysis of Piezoelectric Structures by the Adjoint Variable Method. *AIAA Journal*. Vol. 29, No. 8, August 1991, pp. 1313-1318.

71. Kistler, W.A., and S. Saigal, "Three-Dimensional Simulations of Initially Straight Elasticas," *ASCE Journal of Engineering Mechanics*, Vol. 17, No. 10, Oct. 1991, pp. 2384-2395.
72. Saigal, S., and A. Chandra. Shape Sensitivities and Optimal Configurations for Heat Diffusion Problems: a BEM Approach. *ASME Journal of Heat Transfer*. Vol. 113, No. 2, May 1991, pp. 287-295.
73. Aithal, R., S. Saigal, and S. Mukherjee. Three Dimensional Boundary Element Implicit Differentiation Formulation for Design Sensitivity Analysis. *Mathl. Comput. Modeling*. Vol. 15, No. 3-5, 1991, pp. 1-10.

1986-1990

74. Aithal, R., and S. Saigal. Adjoint Structure Approach for Shape Sensitivity Analysis using BEM. *ASCE Journal of Engineering Mechanics*. Vol. 116, No. 12, Dec 1990, pp. 2663-2680.
75. Rencis, J.J., S. Saigal, and K.Y. Jong. Dynamic Viscoelastic Beam Model for Finite Element Method. *ASCE Journal of Aerospace Engineering*, Vol. 3, No. 1, Jan 1990, pp. 19-29.
76. Saigal, S., and J.H. Kane. Boundary Element Shape Optimization System for Aircraft Structural Components. *AIAA Journal*. Vol. 28, No. 7, 1990, pp. 1203-1204. Synoptic.
77. Saigal, S., R. Aithal, and C.T. Dyka. Boundary Element Design Sensitivity Analysis of Symmetric Bodies. *AIAA Journal*, Vol. 28, No. 1, 1990, pp. 180-183. Technical Note.
78. Yang, T.Y., S. Saigal, and D.G. Liaw. Advances of Thin Shell Finite Elements and Some Applications - Version I. *Computers and Structures*. Vol. 35, No. 4, 1990, pp. 481-504.
79. Saigal, S. Iteration Schemes for Improved Convergence in Boundary Element Reanalysis. *Computer Methods in Applied Mechanics and Engineering*. Vol. 84, 1990, pp. 97-107.
80. Chandra, A., and S. Saigal. A Boundary Element Analysis of the Axisymmetric Extrusion Processes. *International Journal of Nonlinear Mechanics*, Vol. 26, No. 1, January 1991, pp. 1-13.
81. Saigal, S., and J.H. Kane. Design Sensitivity Analysis of Boundary Element Substructures. *AIAA Journal*, Vol. 28, No. 7, July 1990, pp. 1277-1284.

82. Saigal, S. Reanalysis for Structural Modifications in Boundary Element Response and Design Sensitivity Analysis. *AIAA Journal*, Vol. 28, No. 2, February 1990, pp. 323-328.
83. Ram-Mohan, L.R., S.Saigal, D. Dossa, and J. Shertzer, "The Finite Element Method for Energy Eigenvalues of Quantum Mechanical Systems," *Computers in Physics*, January/February 1990, pp. 50-59.
84. Saigal, S., A. Gupta, and J. Cheng. Stepwise Linear Regression Particular Integrals for Uncoupled Thermoelasticity with Boundary Elements. *International Journal of Solids and Structures*, Vol. 26, No. 4, 1990, pp. 471-482.
85. Kane, J.H., B.L.K. Kumar, and S. Saigal. An Arbitrary Condensing, Noncondensing Solution Strategy for Large Scale, Multi-Zone Boundary Element Analysis. *Computer Methods in Applied Mechanics and Engineering*, Vol. 79, No. 2, April 1990, pp. 219-244.
86. Yunus, S.M., P.C. Kohnke, and S. Saigal. An Efficient Through-Thickness Integration Scheme in an Unlimited Layer Doubly Curved Isoparametric Composite Shell Element. *International Journal for Numerical Methods in Engineering*, Vol. 28, December 1989, pp. 2777-2793.
87. Saigal, S., R. Aithal, and J.H. Kane. Conforming Boundary Elements in Plane Elasticity for Shape Design Sensitivity. *International Journal for Numerical Methods in Engineering*, Vol. 28, December 1989, pp. 2795-2811.
88. Saigal, S., R. Aithal, and J.H. Kane. Semianalytical Structural Sensitivity Formulation in Boundary Elements. *AIAA Journal*. Vol. 27, No. 11, November 1989, pp. 1615-1621.
89. Saigal, S. Treatment of Body Forces in Axisymmetric Boundary Element Design Sensitivity Formulation. *International Journal of Solids and Structures*. Vol. 25, No. 8, 1989, pp. 947-959.
90. Kane, J.H., A. Gupta, and S. Saigal, "Reusable Intrinsic Sample Point (RISP) Algorithm for the Efficient Numerical Integration of Three Dimensional Curved Boundary Elements. *International Journal for Numerical Method in Engineering*. Vol. 28, No. 7, July 1989, pp. 1661-1676.
91. Saigal, S., J.T. Borggaard, and J.H. Kane. Boundary Element Implicit Differentiation Equations for Design Sensitivities of Axisymmetric Structures. *International Journal of Solids and Structures*, Vol. 25, No. 5, May 1989, pp. 527-538.

92. Yunus, S.M., S. Saigal, and R.D. Cook, "On Improved Hybrid Finite Elements with Rotational Degrees of Freedom," *International Journal for Numerical Methods in Engineering*, Vol. 28, No. 4, April 1989, pp. 785-800.
93. Agrawal, O.P., and S. Saigal, "Dynamic Analysis of Multi-body Systems Using Tangent Coordinates," *Computers and Structures*, Vol. 31, No. 3, March 1989, pp. 349-356.
94. Saigal, S., and W.A. Kistler. A Direct Vector Simulation for the Analyses of Nodal and Undulating Elastica. *International Journal of Solids and Structures*, Vol. 25, No. 2, February 1989, pp. 201-211.
95. Yang, T.Y., R.K. Kapania, and S. Saigal. Accurate Rigid Body Modes Representation for a Nonlinear Curved Thin Shell Element. *AIAA Journal*, Volume 27, No. 2, February 1989, pp. 211-218.
96. Kane, J.H., and S. Saigal. Design Sensitivity Analysis of Solids Using BEM. *Journal of Engineering Mechanics, ASCE*, Volume 114, No. 10, October 1988, pp.1703-1722.
97. Agrawal, O.P., M. M. Stanisic, and S. Saigal. Dynamic Responses of Orthotropic Plates Under Moving Masses. *Ingenieur-Archiv*, Vol. 58, 1988, pp. 9-14.
98. Saigal, S., T.Y. Yang, and W. Soedel, "Inflation and Contact Prediction of Composite Tire Shell Carcass," *Journal of Aircraft, AIAA*, Volume 24, No. 12, 1987, pp. 849-855.
99. Wu, Y.C., T.Y. Yang, and S. Saigal. Free and Forced Nonlinear Dynamics of Composite Shell Structures. *Journal of Composite Materials*, Volume 21, No. 10, October 1987, pp. 898-909.
100. Saigal, S., T.Y. Yang, and R.K. Kapania. Dynamic Buckling of Imperfection-Sensitive Shell Structures. *Journal of Aircraft, AIAA*, Volume 24, No. 10, 1987, pp. 718-724.
101. Agrawal, O.P., and S. Saigal. A Novel, Computationally Efficient Approach for Hamilton's Law of Varying Action. *International Journal of Mechanical Sciences*, Volume 29, Nos. 3 & 4, 1987, pp. 285-292.
102. Saigal, S., O.P. Agrawal, and M.M. Stanisic. Influence of Moving Masses on Rectangular Plate Dynamics. *Ingenieur-Archiv*, Volume 57, 1987, pp. 187-196.
103. Mamalis, A.G., D.E. Manolacos, S. Saigal, G. Viegelaahn, and W. Johnson. Extensible Plastic Collapse of Thin Wall Frusta as Energy Absorbers. *International Journal of Mechanical Sciences*, Volume 28, No. 4, 1986, pp. 219-229.

104. Saigal, S. Dynamic Behavior of Beam Structures Carrying Moving Masses. *Journal of Applied Mechanics, Transactions of the ASME*, Volume 108, March 1986.
105. Saigal, S., R.K. Kapania, and T.Y. Yang. Geometrically Nonlinear Finite Element Analysis of Imperfect Laminated Shells. *Journal of Composite Materials*, Volume 20, No. 2, March 1986, pp. 197-214.
106. Saigal, S., H.W. Kim, T.Y. Yang, and W. Soedel. Free Vibrations of a Tire as a Toroidal Membrane. *Journal of Sound and Vibration*. Volume 107, No. 1, 1986, pp. 71-82.

1984-1985

107. Saigal, S., and T.Y. Yang. Elastic-Viscoplastic, Large Deformation Formulations of a Curved Quadrilateral Thin Shell Element. *International Journal for Numerical Methods in Engineering*. Volume 21, No. 10, October 1985, pp. 1897-1910.
108. Saigal, S., and T.Y. Yang. Nonlinear Dynamic Analysis with a 48 D.O.F. Curved Thin Shell Element. *International Journal for Numerical Methods in Engineering*. Volume 21, No. 6, June 1985, pp. 1115-1128.
109. Yang, T.Y., and S. Saigal. A Curved Quadrilateral Element for Static Analysis of Shells with Geometric and Material Nonlinearities. *International Journal for Numerical Methods in Engineering*. Volume 21, No. 4, April 1985, pp. 617-636.
110. Yang, T.Y., and S. Saigal. A Simple Element for Static and Dynamic Response of Beams with Material and Geometric Nonlinearities. *International Journal for Numerical Methods in Engineering*. Vol. 20, No. 5, May 1984, pp. 851-868.

Selected Conference Papers

1. Kikidis, D., Saigal, S., Papaioannou, G. "Orthonormality as a Tool for the Improved Interpretation of IPECSTM Kinetics Measurements." American Academy of Orthotists & Prosthetists, 39th Academy Annual Meeting and Scientific Symposium, February 20-23, 2013
2. Kikidis, D., Saigal, S., Papaioannou, G. "Sagittal Asymmetry in Bilateral Amputee Gait Kinetics." ORS 2013 Annual Meeting, San Antonio, TX, January 2013.
3. Kikidis, D., Saigal, S., Papaioannou, G. "Directional Variations in the Prosthetic Pylon Resultant Forces of Transtibial Amputees during Prolonged Strenuous Activities." ORS 2013 Annual Meeting, San Antonio, TX, January 2013.

4. Li, K., S. Saigal and M. Frankle. Effect of Component Size and Lateral Offset on the Fixation of the Reverse Shoulder Prosthesis. *Second International Symposium on Treatment of Complex Shoulder Problems*, Jan. 13-15, 2005.
5. Li, K., Mudhivarthi, S., Saigal, S., and Kumar, A., "Mechanical characterization of multilayer thin film stacks containing porous silica using nanoindentation and the finite element method", *Materials Research Society Symposium Proceedings 875*, art. no. O2.3, pp. 43-48, 2005.
6. Khan, S., Ganguly, A. R., and Saigal, S., Nonlinear Dynamics and Prediction in Hydrology, *Institute for Operations Research and the Management Sciences (INFORMS) Meeting*, Denver, October 24-27, 2004.
7. White, D.R., Leland, R.W., Saigal, S. and Owen, S.J. The Meshing Complexity of a Solid – An Introduction. Proceedings, 10th International Meshing Roundtable, Sandia National Laboratories, NM, pp. 373-384, Oct. 7-10, 2001.
8. Rahulkumar, P., A. Jagota, S. Saigal, and S.J. Bennison. Cohesive Zone Models and Finite Elements for Adhesive and Cohesive Fracture. European Adhesion Conference EURADH '98. September 6-11, 1998. Garmisch-Partenkirchen, Germany.
9. Salem, A.Z.I., S.A. Canann, and S. Saigal. Robust Quality Metric for Quadratic Triangular 2D Finite Elements. McNu'97 conference: the 1997 Joint ASME/ASCE/SES meeting, June 29-July2, 1997, Evanston, IL
10. Rahulkumar, P., and S. Saigal, "Numerical Studies of Excavations in Saturated Soil Using Modified Cam-Clay Plasticity Models," in *Explicit Computations for Reinforced Concrete and Geological Materials*, Third U.S. National Congress on Computational Mechanics, June 12-14, 1995, Dallas, TX.
11. Tetambe, R.P., and S. Saigal, "A Comparative Study of Flux Projection Type Estimators in Elasto-Plastic Finite Element Analysis," ASME International Computers in Engineering Conference, Minneapolis, MN, September 1994.
12. Bezerra, L.M., and S. Saigal, "A Boundary Integral Formulation for the Inverse Problem of Detecting Open Cracks," ASME PVP-280, pp. 11-19, 1994 ASME Pressure Vessels and Piping Conference, June 19-23, Minneapolis, MN.
13. Xu, Y., S. Saigal, and H.E. Rubash, "Effect of Orientation of Acetabular Component in Total Hip Arthroplasty on Polyethylene Stresses," 13th Southern Biomedical Engineering Conference, Washington DC, April 1994
14. Wang, P.T., H. Li, and S. Saigal, "A Comparative Study of the Internal State Variables Constitutive Models for Metals," Submitted to the 4th International

Symposium on Plasticity and Its Current Applications, July 19-23, 1993, Baltimore, MD.

15. Nicolau, P.D., H.R. Piehler, and S. Saigal, "Finite Element Analysis of the Consolidation Behavior of Composite Materials Using the Foil/Fiber/Foil Technique," Concurrent Engineering Approach to Materials Processing, S.N. Diwedi, A.J. Paul, and R.F. Dax, editors, 247-260, TMS, Warrendale, PA 1992.
16. Turkiyyah, G., J. Jaeger, S. Saigal, S. Talukdar, and S. Subramanyam, "A Mechanical Strength Critic for a Simultaneous Engineering Design Environment," Ninth Structures Conference, 1991, and Tenth Conference on Electronic Computation, April 29-May 1, 1991, Indianapolis, Indiana.
17. Hopkins, D.A., S. Saigal, and X. Zeng, "Computational Micromechanics of Woven Composites," ASME AMD-118, Mechanics of Composites at Elevated and Cryogenic Temperatures, S. Singhal and C. Herakovich (editors), May 1991.
18. Talukdar, S., M. Sapossnek, L. Hou, R. Woodbury, S. Sedas, and S. Saigal, "Autonomous Critics," Concurrent Design Conference, West Virginia University, Morgantown, VA., February 7-9, 1990.
19. Saigal, S., and R. Aithal, "A Variational Approach for the Sensitivity of Stress Constraints Using Boundary Elements," ISBEM 89 Conference, United Technologies Research Center, October 2-4, 1989, East Hartford, Connecticut.
20. Saigal, S., W. Johnson, and A.G. Mamalis, "The Plastic Collapse of Thin-Walled, Small Angle Frusta Under Axial Load and Energy Absorption," International Symposium on Intense Dynamic Loading and Its Effects, Beijing, China, June 3-7, 1986.
21. Agrawal, O.P., and S. Saigal, "Dynamic Analysis of an Orthotropic Plate Under a Moving Mass," Professor R.L. Bisplinghoff Memorial Symposium on Recent Trends in Aeroelasticity, Structures and Structural Dynamics, February 6-7, 1986, Gainesville, Florida.
22. Saigal, S., and T.Y. Yang, "Elastic-Viscoplastic Thin Shell Analysis," Engineering Mechanics in Civil Engineering, Vol. 2, Proceedings of the Fifth ASCE EMD Specialty Conference held at Laramie, Wyoming, A.P. Borelli and K.P. Chong (editors), August 1-3, 1984, pp. 1153-1156.
23. Yang, T.Y., and S. Saigal, "Materially Nonlinear, Static and Dynamic Response of Shell Structures Using Quadrilateral Elements," Numerical Methods for Nonlinear Problems, Vol.2, Proceedings of the International Conference held at Barcelona, Spain. C. Taylor, E. Hinton, D.R.J. Owen and E. Onate (editors), April 9-13, 1984, pp. 612-624.

Technical Reports (Partial List)

1. Saigal, S. "Constitutive Models for Concrete", report submitted to ANSYS, Inc., January 2001.
2. Schmidt, D., S. Muralidhar, S. Saigal, P. Knupp, and R. Leland, "Comparative Study of Hexahedral and Tetrahedral Elements", report submitted to Sandia National Laboratories, Albuquerque, NM, August 2000.
3. Li, H., S. Saigal, and P.T. Wang, "Contact Interactions between spherical powder particles undergoing large deformations during packing," ALCOA Technical Center FABT Department Report No. 95-12-007, Alcoa City, PA, 1995
4. Zeisler, C.R., S. Saigal, and R.S. Gallagher, "Adaptive Visualization of 2D Boundary Data", CMU Report No. R93207, 1993
5. Saigal, S., and H. Li, "CAE Software for Electromagnetic Devices and Processes," report submitted to Swanson Analysis Systems, Inc., August 1992; and to Ben Franklin Technology Center, August, 1992.
6. Saigal, S. "Shape Sensitivities and Optimal Configurations for Heat Diffusion Problems: A BEM Approach," report submitted to General Dynamics Electric Boat Division, Groton, Connecticut, September 18, 1989.
7. Kane, J.H., S. Saigal, and A. Gupta, "Three-Dimensional Computational Simulation of the Metal Forging Process Utilizing the Boundary Element Method," report submitted to Wyman-Gordon Company, Worcester, MA, August 10, 1988.
8. Yang, T.Y., and S. Saigal, "Nonlinear Shell Element Formulations for Dynamic Responses of Cooling Towers," report submitted to the National Science Foundation, June 8, 1984.
9. Yang, T.Y., and S. Saigal, "Development of Beam-Column Element for Nonlinear Dynamic Analysis of Columns Supporting Shell Structures," report submitted to the National Science Foundation, November 5, 1982.

SELECTED INVITED PRESENTATIONS

Curriculum Innovation, Panel Presentation (with Theo Andrews and Jaime Bonilla). ASEE Global Engineering Deans Council, Beijing, China, October 26, 2011.

Completing the Cycle of Innovation in Engineering Education by Fostering Implementation of Best Practices, Panel Presentation (with C. Papadopoulos, M.W. Ohland, C.J. Atman, R.A. Streveler and A. Dollar). ASEE Conference, Vancouver, Canada, June 28, 2011.

Cohesive Zone Models for Polymer Interfacial Fracture Simulations, Purdue University, November 10, 2000.

Computational Cohesive Zone Modeling of Fracture, Department of Mechanical Engineering, Johns Hopkins University, November 5, 1998.

Mechanics and Materials Highlights, AFOSR Mechanics and Materials Program Review, October 14, 1998, Dayton, OH.

NSF Mechanics and Materials Programs, IMM Young Investigators' Meeting, Seattle, WA, October 1996.

Research Directions in Computational Mechanics in the U.S., Indian Institute of Science, Bangalore, India, December 1995.

Research on the Acetabular Component in Total Hip Arthroplasty, Department of Orthopaedic Surgery, University of Pittsburgh Medical Center, June 1994.

An Internal State Variables Model for Compaction of Powder Packings, ALCOA Technical Center, February 1994.

Finite Element Analysis and Applications in Orthopaedics, Department of Orthopaedic Surgery, University of Pittsburgh Medical Center, March 1993.

Issues in Modeling of Powder Consolidation Processes, Semiannual Meeting of the Center for Advanced Deformation Processing Research, Carnegie Mellon University, January 1993.

Boundary Element Sensitivity Analyses with 2D Applications, Institut für Technische Mechanik, Universität Karlsruhe, Germany, May 1992.

Contact and Inverse Problems with Boundary Elements using Optimization Techniques, Lehrstuhl für Technische Mechanik, Universität Erlangen-Nürnberg, Germany, June 1992.

Research Advances and Directions in Boundary Element Design Sensitivity Analysis for Shape Optimization, Department of Civil Engineering, University of Split, Split, Yugoslavia, December 1990, also Department of Civil Engineering, University of Belgrade, Belgrade, Yugoslavia, January 1991.

Review of Research Activities in Computational Mechanics at CMU, Rockwell International, El Segundo, CA, January 1990.

Some Research Aspects of Boundary Element Design Sensitivity Analysis, Department of Theoretical and Applied Mechanics, Cornell University, March 1989.

A Finite Strain Shell Theory with Non-Rotating Principal Directions, Department of Civil Engineering, Rutgers University, New Brunswick, NJ, October 1988.

RESEARCH SUPERVISION

Completed Ph.D. Theses

Aithal, Raghavendra, "Boundary Element Formulations for Shape Design Sensitivity Analysis Using Implicit Differentiation," unpublished PhD Dissertation, Department of Mechanical Engineering, Worcester Polytechnic Institute, Worcester, MA, August 1989. Presently Senior Development Engineer, Automated Analysis Corporation, Ann Arbor, MI.

Bezerra, Luciano M., "Inverse Elastostatics Solutions with Boundary Elements", unpublished PhD Dissertation, Department of Civil Engineering, Carnegie Mellon University, Pittsburgh, PA, July 1993. Presently Assistant Professor, Instituto de Pesquisas Energeticas e Nucleares, Brazil.

Simunovic, Srdan, "Boundary Element Formulations for Contact Problems", unpublished PhD Dissertation, Department of Civil Engineering, Carnegie Mellon University, Pittsburgh, PA, August 1993. Presently Member of the Technical Staff, Materials Process Modeling Division, Oak Ridge National Laboratory, Oak Ridge, TN.

Kaljevic, Igor, "Probabilistic Formulation with Boundary Elements", unpublished PhD Dissertation, Department of Civil Engineering, Carnegie Mellon University, Pittsburgh, PA, August 1993. Presently Development Engineer, ANSYS, Inc., Houston, PA.

Li, Hui, "Constitutive Modeling for Densification of Aluminum Powder Aggregate", unpublished PhD Dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, July 1994. Presently Senior Software Engineer, Utility Translation Systems, Inc. (subsidiary of Itron, Inc.), NC

Tetambe., Ravindra P., "Adaptive Remeshing and Rezoning in Nonlinear Finite Element Analysis", unpublished PhD Dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, December 1994. Presently at General Electric Corporate Research and Development, Schenectady, NY

Xu, Yu, "Element Free Galerkin Formulations for Steady Crack Growth in Solids", unpublished PhD Dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, 1997. Presently Development Engineer, ALGOR, Inc. Pittsburgh, PA

Pakalkumar, Rahul, "Computational Fracture Mechanics Using Cohesive Element Formulations", unpublished Ph.D. Dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, 1999. Presently at ExxonMobil, Houston, TX

Barry, William, “Element Free Galerkin Formulations for Large and Small Strain Elastic and Elastoplastic Analysis”, unpublished Ph.D. Dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, 1998. Presently Assistant Professor, Asian Institute of Technology, Thailand.

Zakaria, Ahmed Salem, “Robust Distortion Metric for Quadratic Finite Elements”, unpublished Ph.D. Dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, December 1998. Presently Development Engineer, ANSYS, Inc. Pittsburgh, PA

Owen, Steve, “Non-simplicial Unstructured Mesh Generation. Dissertation”, unpublished Ph.D. dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, 1999. Presently Senior Member of Technical Staff, Parallel Computing Group, Sandia National Laboratory, Albuquerque, NM

Seshadari, Muralidhar, “Mechanics of Glass-Polymer Laminates using Multi Length Scale Cohesive Zone Models”, unpublished Ph.D. dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, 2001. Presently at University of South Florida.

White, David, “Assessment, Metrics, and techniques for Hexahedral Finite Element Mesh Generation”, unpublished Ph.D. dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, 2002. Presently Manager, Sandia National Laboratories, Albuquerque, NM.

Tang, H., “Gradient Effects in Inhomogeneous Plastic Flow and Fracture Behavior of Single Crystals”, unpublished Ph.D. dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, 2003. Presently Postdoctoral Fellow, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA.

Moore, Robert. Meshless Materials Microstructure Analysis, unpublished Ph.D. dissertation, Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, 2007.

Khan, Shiraj, “Nonlinear Dependence and Extremes in Hydrology and Climate”, unpublished Ph.D. dissertation, Department of Civil and Environmental Engineering, University of South Florida, Tampa, FL, 2007.

Post-Doctoral Fellows and Visiting Researchers

Burman, Ake. Analysis of Acetabular Component in Total Hip Arthroplasty, Visiting Professor from Lund Institute of Technology, Lund, Sweden, 1994 -1996.

Shet, Chandrakanth. Crystal Plasticity Simulations in Materials, Post-doctoral Research Assistant, 1996 -1998. Presently employed at Florida A&M University.

Huang, Hao. 2003-2004. Shoulder Biomechanics, Hybrid Particle Methods. Presently employed at ExxonMobil, Houston, TX.

Li, Ke. 2004 - 2005. Shoulder Biomechanics, Nanomechanics of Nanocomposites. Presently employed at Schlumberger Corporation.

Seshadri, Muralidhar. 2005 - 2007. Nanotube Crack Bridging. Presently employed at Schlumberger Corporation.