Anurag Rajagopal

CONTACT INFORMATION	2030 Main Street Suite 100 Irvine, CA 92614	phone: (678) 662 5886 e-mail: anurag.ae@gmail.com http://www.altairhyperworks.com

CURRENT
OCCUPATION

Senior OptiStruct Developer (finite-element solver), Altair Engineering, Irvine, CA

EDUCATION

Ph.D., Aerospace Engineering, Georgia Institute of Technology, 2014   **CGPA: 4/4**
- Advisor: Dr. Dewey H. Hodges
- Thesis title: Advancements in Rotor Blade Cross-Sectional Analysis Using the Variational Asymptotic Method

M.S., Aerospace Engineering, Georgia Institute of Technology, 2011   **CGPA: 4/4**

B.Tech., Aerospace Engineering, Indian Institute of Technology Bombay, 2009   **CGPA: 8.97/10**

RESEARCH
INTERESTS

Computational mechanics, Finite element methods, Acoustics;

Composite materials, Rotor blade analysis, Aeroelasticity;

Ballistic impact, Structural health monitoring;

Fracture & Fatigue, Nonlinear Dynamics;

Numerical methods for PDEs and Nonlinear systems

RESEARCH
EXPERIENCE

Altair Engineering Inc, Irvine, CA

Research and Finite-element Program Development

Engaged in tasks pertaining to the research and software development of various projects focused on, but not limited to, the Noise, Vibration and Harshness (NVH) capabilities of OptiStruct, a finite-element solver and optimizer

- Solution sequences:
    - Statics
    - Normal Modes
    - Complex Eigenvalue analysis
    - Frequency response (of structural and acoustic systems)
    - Transient response
    - Random response
    - Component Mode Synthesis for flexbody and external superelement generation
- Features:
    - Preloaded/ Pre-stressed analysis
    - Instabilities of brake systems (Squeal)
    - Rigid body elements
    - Acoustic absorber element
    - Shell-to-solid connector element
    - Particle velocity for acoustic analysis
    - Coupled fluid-structure modes for acoustics
    - Infinite elements for exterior acoustics
    - Rotor dynamics

Georgia Institute of Technology, Atlanta, GA

Efficient High-fidelity Multi-Physics Tools for Smart Blade Analysis and Design

- Worked on several tasks pertaining to increasing the capabilities and verifying existing features in VABS, a computer program used in composite rotor blade structural modeling
- For smart rotor blades, VABS reduces the labor and computational time associated with commercial FEA programs (for e.g., ABAQUS) by several orders of magnitude
- Achieved state of the art progress in several topics including:
    1. Modeling spanwise non-uniform rotor blades
    2. Analytical verification of the initial curvature effect
    3. Higher fidelity stress-strain-displacement recovery
    4. Theory for swept blades/wings
    5. Modeling initially twisted/curved thin-walled rotor blade segments
    6. Analysis of plates of variable thickness

Indian Institute of Technology Bombay, Mumbai, India

Oblique Ballistic Impact Behavior of Composites

- Proposed an analytical model to study the behavior of composites under oblique ballistic impact; trends in ballistic limit velocity and energy absorbed by various mechanisms were studied.
- Engineered experimental studies using E-glass composites to successfully validate the model

Structural Health Monitoring using Lamb Waves

- Conducted a literature review from the historical perspective to the state of art on the health monitoring process of aircrafts using Lamb waves

Ansys Inc, Pune, India

Study of Radiation Models

- Carried out a detailed study and comparison of the radiation models in Fluent 12.0 and CFX 11.0 for various test cases

TEACHING EXPERIENCE

Georgia Institute of Technology, Atlanta, GA

School of Aerospace Engineering
- Introduction to Structural Dynamics and Aeroelasticity
- Rotorcraft Dynamics
- Advanced Dynamics I

School of Mathematics
- Iterative Methods for Systems of Equations

JOURNAL ARTICLES

Hodges, Dewey H.; Rajagopal, Anurag; Ho, Jimmy C.; and Yu, Wenbin: "Stress and Strain Recovery for the In-plane Deformation of an Isotropic Tapered Strip-Beam," *Journal of Mechanics of Materials and Structures*, Vol. 5, No. 6, 2010, pp. 963 – 975.

Rajagopal, Anurag; Hodges, Dewey H.; and Yu, Wenbin: "Asymptotic Beam Theory for Planar Deformation of Initially Curved Isotropic Strips," *Thin Walled Structures*, Vol. 50, No. 1, 2012, pp. 106 – 115.

Rajagopal, Anurag; and Hodges, Dewey H.: "Analytical Beam Theory for the In-plane Deformation of a Composite Strip with In-plane Curvature," *Composite Structures*, Vol. 94, No. 12, 2012, pp. 3793 – 3798.

Rajagopal, Anurag; and Hodges, Dewey H.: "Asymptotic Approach to Oblique Cross-Sectional Analysis of Beams," *Journal of Applied Mechanics*, Vol. 81, No. 3, 2014, article 031015.

Rajagopal, Anurag; and Naik, N.K.: "Oblique Ballistic Impact Behavior of Composites," *International Journal of Damage Mechanics*, Vol. 23, No. 4, 2014, pp. 453 – 482.

Rajagopal, Anurag; and Hodges, Dewey H.: "Variational Asymptotic Analysis for Plates of Variable Thickness," *International Journal of Solids and Structures*, Vol. 75 – 76, 2015, pp. 81 – 87.

Rajagopal, Anurag; and Hodges, Dewey H.: "Generalized Timoshenko and Vlasov Theories for Oblique Cross-Sectional Analysis of Rotor Blades," *Journal of the American Helicopter Society*, Vol. 63, No. 3, 2018, pp. 1–13.

Rajagopal, Anurag; and Hodges, Dewey H.: "Moment vs. Curvature for a Beam under Self-weight," *Engineering Structures*, Vol. 186, 2019, pp. 321–322.

Rajagopal, Anurag; and Hodges, Dewey H.: "Minimization of the Total Potential Energy using Variational-Asymptotic Warping Solutions for Beams," *Mathematics and Mechanics of Solids*, Vol. 24, No. 6, pp. 1782–1784.

Rajagopal, Anurag: "A Variational Asymptotic based Shear Correction Factor for Isotropic Circular Tubes," *AIAA Journal*, to appear, 2019.

CONFERENCE PRESENTATIONS	Rajagopal, Anurag; Hodges, Dewey H.; and Yu, Wenbin: "Asymptotic Beam Theory for Planar Deformation of Initially Curved Isotropic Strips," *52nd Structures, Structural Dynamics, and Materials Conference*, Denver, Colorado, April 4 – 7, 2011, Paper AIAA-2011-1853.

Rajagopal, Anurag and Hodges, Dewey H.: "Laminated Beams with Initial Curvature: A Variational Asymptotic Approach," *49th Annual Technical Meeting, Society of Engineering Science*, Atlanta, Georgia, October 10 – 12, 2012.

Rajagopal, Anurag and Hodges, Dewey H.: "Asymptotic Approach to Oblique Cross-Sectional Analysis of Beams," *54th Structures, Structural Dynamics, and Materials Conference*, Boston, Massachusetts, April 8 – 11, 2013, Paper AIAA-2013-1610.

Rajagopal, Anurag and Hodges, Dewey H.: "Generalized Timoshenko and Vlasov Theories for the Oblique Cross-Sectional Analysis of Rotor Blades," *Proceedings of the 70th Annual Forum of the American Helicopter Society*, Québec, Montréal, May 20 – 22, 2014.

Rajagopal, Anurag and Mandal, Dilip K.: "A Quasi-Static Solution for the Maneuvering Analysis of Vehicles with Rotors," *AIAA Scitech 2019 Forum*, San Deigo, California, January 7 – 11, 2019, Paper AIAA 2019-0863.

Rajagopal, Anurag, Mandal, Dilip, Saiki, Junji and Patnaik, Ujwal: "Exterior Acoustics Using Infinite Elements," *SAE Noise and Vibration Conference and Exhibition*, Grand Rapids, Michigan, June 10 – 13, 2019, Paper 2019-01-1508.

HONORS AND AWARDS

Awarded permanent residency in the US in EB1A category

Invited for Purdue University's prospective faculty workshop 2014

Graduate research assistantship by US army Vertical Lift Research Center of Excellence (VLRCOE)

Awarded SGA, COE travel grants for attendance, oral presentations at AIAA conferences (2011,13)

All India rank 3 in GATE(AE) 2009

Ranked 2nd in Aerospace Engineering (AE) class of 2009, IITB

Secured above 99 percentile in national level university entrance examination conducted by IIT

Stood fourth in Andhra Pradesh (A.P.) junior intermediate examination

Second position in regional mathematics olympiad (A.P.) 2002

Winning entry in essay writing competition held by Vijay arts academy (Theme: Village Life)

PROFESSIONAL EXPERIENCE		
	Senior OptiStruct Developer Altair Engineering Inc.	May 17 – present
	OptiStruct Developer Altair Engineering Inc.	Nov 14 – May 17
	Post Doctoral Researcher Daniel Guggenheim School of Aerospace Engineering, Georgia Tech.	May 14 – Aug 14
	Graduate Research Assistant Daniel Guggenheim School of Aerospace Engineering, Georgia Tech.	Aug 09 – Apr 14

Graduate Teaching Assistant	Jan 11/13/14 – Apr 11/13/14
Daniel Guggenheim School of Aerospace Engineering, Georgia Tech.	
Graduate Teaching Assistant	Jan 12 – Apr 12
School of Mathematics, Georgia Tech.	
Intern	May 08 – Jul 08
Ansys Fluent Pvt. Ltd., Pune, India	
Student organizer	Oct 12
49th Annual Technical Meeting of the Society of Engineering Science	
Coordinator	Aug 06 – Apr 07
Entrepreneurship-cell, IIT Bombay	

PROFESSIONAL AFFILIATIONS

Journal reviewer: International Journal of Engineering Science, Nonlinear Dynamics, European Journal of Mechanics-A/Solids, International Journal of Solids and Structures, Aeronautical Journal, Engineering Structures, Finite Elements in Analysis and Design, Journal of Engineering Mechanics, AIAA Journal, Mathematical and Computer Modelling of Dynamical Systems, Shock and Vibration, Earthquake Science, Mechanics of Composite Materials

Conference reviewer: ASME International Mechanical Engineering Congress & Exposition

PROGRAMMING

Fortran, C++, Python

SOFTWARE

Finite Element: Hyperworks, ABAQUS
Math: Matlab, Mathematica
Scientific writing: LaTeX 2_ε, MS office, Inkscape

LANGUAGES

English, Hindi

GRADUATE COURSEWORK

Structural Dynamics, Aeroeleasticity, Aerospace Structural Analysis, Energy Methods, Elasticity, Structural Stability I&II, Finite Element Methods, Linear Algebra, Math Methods of Applied Sciences, Iterative methods for Linear and Nonlinear Equations, Numerical methods for PDEs, Advanced Dynamics I&II, Helicopter Stability and Control, Calculus of Variations, Kinetics and Thermodynamics of Gasses, Fracture and Fatigue, Rotorcraft Dynamics, Differential Geometry in Solid Mechanics, Unsteady Aerodynamics

UNDERGRADUATE COURSEWORK

Elastic analysis of Plates and Laminates, Spaceflight Mechanics, Optmization Methods, CFD, Aircraft Design, Aircraft and Aerospace Propulsion, System: Modeling, Dynamics & Control, Heat Transfer, Low and High Speed Aerodynamics, Flight Mechanics, Engineering Graphics, Multivariable Calculus, Real Analysis, ODE, Complex Analysis and PDE, Numerical methods for Differential Equations

OTHER COURSEWORK

Introduction to Computer Science and Programming Using Python, Introduction to Linux

HOBBIES

Swimming, Hiking, Biking, Reading and Squash

PUBLIC PROFILES

Google Scholar
ORCID
ResearchGate

REFERENCES

Available on request

OTHER INFORMATION

Citizenship: Indian, Permanent Resident of the United States
Sex: Male
Date of Birth: 20th December 1987