S. Rani

Assistant Professor

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BIO:

Dr. Rani received his Ph.D. in Mechanical Engineering from the University of Illinois at Urbana-Champaign (UIUC) in 2002. He earned his M.S. in 1998 from the Texas A&M University, and B.E. (Honors) in 1996 from the Birla Institute of Technology and Science (India), both in Mechanical Engineering. He has also served as a Postdoctoral Associate in the Department of Mechanical and Aerospace Engineering at Cornell University from 2002 to 2004. At UIUC, Dr. Rani performed research at the Center for Simulation of Advanced Rockets (CSAR) on the effects of oxidized solid-fuel (alumina) particles on flow turbulence. This work involved extensive DNS and LES studies of high Reynolds numbers flows with dispersed particles. It also helped him gain substantial experience in both MPI and OpenMP paradigms of parallel computing. From 2005 to 2011, Dr. Rani has served as a Research Engineer at the CFD Research Corporation (CFDRC), Huntsville, Alabama. At CFDRC, Dr. Rani has been the PI of and has successfully executed various SBIR and STTR projects totaling nearly $2million. At CFDRC, he has been involved in the successful implementation of LES-based velocity and thermal turbulent boundary layer models in a Navy Phase II SBIR, as well as being the PI in a NASA Phase I/Phase II STTR dealing with radiation modeling. Dr. Rani is an expert in code development in the Loci framework, in which all initial model implementation will be undertaken in this effort. He was also the PI of an AFOSR-funded STTR Phase I project (TPOC: Dr. Fariba Fahroo) to predict radiation in media with orders of magnitude variation in optical thickness, encountered, for example, in hypersonic flows. Since August 2011, Dr. Rani is serving as Assistant Professor in the Mechanical and Aerospace Engineering Department at UAHuntsville. Dr. Rani is a U.S. Permanent Resident and a citizen of India.

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RELEVANT PUBLICATIONS :

1. Sarma L. Rani, On the Closure of the PDF Kinetic Equation for High Stokes Number Particles in Isotropic Turbulence, 2013 (submitted to Aerosol Science and Technology journal).
2. Sarma L. Rani, and D. L. Koch, A Stochastic Model for PDF of Relative Velocity of High Stokes Number Particles in Isotropic Turbulence, 2013 (submitted to Journal of Fluid Mechanics).
3. H. Q. Yang, A. Przekwas, Sarma L. Rani, and J. Dudley, Direct Numerical Simulation Validation Study of a Fully Coupled Fluid-Structure Interaction Tool, AIAA 2013.
4. H. Q. Yang, and Sarma L. Rani, Micro Air Vehicle Performance Enhancement Using Excited Flexible Lifting Surface, AIAA 2011.
5. Sarma L. Rani, Reduced Order Model for Combustion Instability in a 2-D Duct with a Bluffbody Flameholder, AIAA Journal of Propulsion and Power, Vol. 25, No. 1, 2009.
6. C. M. Winkler, and Sarma L. Rani, Lift Forces on Dense Particles Due to Turbulence-Driven Secondary Flows, Powder Technology, Vol. 190, No. 3, 2009.
7. Sarma L. Rani, Clifford E. Smith, and Andrew C. Nix, Boundary Layer Equation-Based Wall Modeling for Large Eddy Simulation of Turbulent Flows with Wall Heat Transfer, Numerical Heat Transfer: Part B, Vol. 55, No. 2, 2009.
8. J. F. Horn, D. O. Bridges, D. A. Wachspress, and Sarma L. Rani, Implementation of a Free-Vortex Wake Model in Real-Time Simulation of Rotorcraft, Journal of Aerospace Computing, Information, and Communication, Vol. 3 (March), 2006.
9. C. M. Winkler, Sarma L. Rani, and S. P. Vanka, A numerical study of particle wall-deposition in a turbulent square duct flow, Powder Technology, Vol. 170(1), pp. 12-25, 2006.
10. C. M. Winkler, Sarma L. Rani, and S. P. Vanka, Evaluation of subgrid scale kinetic energy models in large eddy simulations of turbulent channel flow, International Journal of Numerical Methods for Heat and Fluid Flow, Vol. 16, No. 2, pp. 226-239, 2006.
11. J. Chun, D. L. Koch, Sarma L. Rani, A. Ahluwalia, and L. R. Collins, *Clustering of aerosol particles in isotropic turbulence*, Journal of Fluid Mechanics, Vol. 536, pp. 219-251, 2005.