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CONTACT INFORMATION

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RESEARCH INTERESTS

High Performance Computing, Numerical Modeling and Simulation, Algorithm Design and Analysis, Cloud Computing, Autonomous Vehicles Design, Modular Nuclear Reactor Design

RESEARCH HIGHLIGHTS

Dr. Xiang Zhao has over 20 years of research experience in high performance computing, numerical modeling and simulation, and algorithms design and analysis. Especially, she has focused on multi-disciplinary research on developing numerical models and high performance algorithms for large-scale computing-intensive scientific problems in aerospace, aviation, energy, and other engineering and science areas. Dr. Zhao's recent research work has been funded by DOE, NRC, NASA, USDE, DOD and NSF. She has authored and co-authored over 50 journal and conference papers, and also presented in numerous top-notch international conferences and workshops in her areas.

Dr. Zhao's recent research activities include: 1) Modeled and analyzed the thermal flow system in modular nuclear reactors; 2) Modeled and analyzed the aero-elastic coupling on the rocket nozzles; 3) Developed new dynamic load balancing algorithms for large-scale distributed system simulations; 4) Developed an innovative parallel dynamic mesh method to predict unsteady flows with multiple moving objects; 5) Developed a parallel grid adaptation method for unstructured flow solvers; 6) Developed a parallel Algebraic Multi-Grid algorithm for unstructured flow solvers; 7) developed a CFD-DEM coupling algorithm for fluid-particle systems; 8) Investigated the aerodynamics and control of high-speed autonomous vehicles; and 9) research on evidence-based teaching pedagogy for STEM education.

SELECTED PUBLICATIONS

Journal Papers

1. 2016, "The fabrication of carbon nanotube electronic circuits with dielectrophoresis" *Microelectronic Engineering*, vol.164 (2016), pp. 123–127.

2. 2015, "A Computational Approach for Aero-Heating with Thermal Coupled Fields", *AIAA Journal of Thermophysics and Heat Transfer,* http://arc.aiaa.org/doi/abs/10.2514/1.T4633
3. 2015, "Modeling Stationary and Dynamic Pebbles in a Pebble Bed Reactor", *Annals of Nuclear Energy,* pp.52-61, (DOI: 10.1016/j.anucene.2015.01.028).
4. 2014, "Development of an Aeroelastic Modeling Capability for Transient Nozzle Flow Analysis", *Journal of Propulsion and Power*, Vol. 30(6), pp. 1692-1700 (DOI: 10.2514/1.B35277)
5. 2014, "CFD Development For Macro Particle Simulations", *International Journal of Computational Fluid Dynamics,* DOI: 10.1080/10618562.2014.924621, Taylor & Francis
6. 2014, "Generalized Formulations For Rhie-Chow Interpolation", *Journal of Computational Physics*, vol. 258, 880-914, 01/2014 (http://dx.doi.org/10.1016/j.jcp.2013.11.006)
7. 2013, "Aeroelastic Response of Rocket Nozzles to Asymmetric Thrust Loading", *Computers and Fluids*, vol. 76, 128-148, 2013 (dx.doi.org/10.1016/j.compfluid.2013.01.022)
8. 2012, "Transonic Wing Flutter Predictions by a Loosely-Coupled Method", *Computers and Fluids*, vol. 58, 45-62, 2012 (doi:10.1016/j.compfluid.2012.01.002)
9. 2011, "Gas Flow Simulations in Randomly Distributed Pebbles"**,** ASME *Journal of Engineering for Gas Turbines and Power*, Vol. 133(5), 052913, 2011 (doi:10.1115/1.4002833).
10. 2009, "Parallel CFD-DEM for Fluid-Particle Systems", *Computers & Fluids.*
11. 2007, "Enhancements to Parallelized Algebraic Multi-Grid", *WSEAS Transactions on Mathematics*, Vol. 6(1), 118-125.
12. 2007, "A Repartition and Remapping Algorithm For Dynamic Load Balancing", *WSEAS Transactions on Mathematics*, Vol. 6(1), 91-98.
13. 2005, "High-Resolution Schemes for Bubbling Flow Computations", *Applied Mathematical Modeling,* Vol. 29(12), 1232-1251.
14. 2004, "A Dynamic Mesh Method for Unstructured Grids", *Computational Fluid Dynamics Journal,* Vol. 12, No. 4, 580-593.

Conference Papers

15. 2015, "Effectuating Evidence-based Transformative Pedagogical Approaches in STEM Foundational Courses—A Pilot Study", *Proceeding of 2015 ASEE Annual Conference and Exposition,* June 14-17, Seattle, WA.
16. 2015, Aeroelastic Response of Rocket Nozzles Subected to Combined Thrust and Side Loads, *Proceedings* of *22nd AIAA Computational Fluid Dynamics Conference, Aviation Forum 2015*, Dallas, TX, 22-26 June 2015
17. 2014, Development of Arbitrary Unstructured Chimera Grid, *Proceedings of 2014 AIAA Science and Technology Forum and Exposition (SciTech 2014)*, National Harbor, Maryland, Jan. 13-17, 2014, AIAA-Paper-2014-0778.
18. 2013, "Development of an Aeroelastic Modeling Capability for Transient Nozzle Side Load Analysis", *Proceedings of 49th AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, July 15-17, 2013.
19. 2013, "Aerodynamic Characteristics of Ejection Seat and Occupant", *51st AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition*, 2013, 10.2514/6.2013-386, AIAA-2013-0386
20. 2013, "Computational Study On A Single Flow Element In A Nuclear Thermal Rocket", *2013 21st International Conference on Nuclear Engineering*, July 29-August 3, 2013, Chengdu, China, ICONE-15683

21. 2013, "Numerical Modeling Of Stationary, Dynamic Pebbles And Gas Flows In A Pebble Bed Reactor", *2013 21st International Conference on Nuclear Engineering*, July 29-August 3, 2013, Chengdu, China, ICONE-15683
22. 2012, "Numerical Simulation of Shock-Induced Nozzle Flow Separation", *Proceeding of 20th International Conference on Nuclear Engineering and 2012 ASME Power Conference*, July 30-August 3, 2012, Anaheim, CA, ICONE20POWER2012-54675
23. 2012, "Flow Simulation in Packed Beds by a Combined DEM and CFD Approach", *Proceedings of ASME Fluid Engineering Summer Conference*, July 8-12, 2012, Puerto Rico, FEDSM2012-72406
24. 2011, "Combined CFD and DEM Simulations of Fluid Flow and Heat Transfer in a Pebble Bed Reactor", *Proceedings of ASME-DOE 2011 Small Modular Reactors Symposium*, September 28-30, 2011, Washington D.C., SMR2011-6517.
25. 2011, "Fluid-Structure Interaction for Flutter Predictions in Transonic and Supersonic Flows", *ASME-JSME-KSME Joint Fluids Engineering Conference*, July 24 - 29, 2011. Hamamatsu, Japan, AJK2011-FED-08030.
26. 2011, "CFD Gas Flow Simulations in a DEM-Resolved Pebble Bed Reactor", *Proceeding of the 19th International Conference on Nuclear Engineering*, ICONE19-43516
27. 2011, "Modeling Stationary and Dynamic Pebbles in a Pebble Bed Reactor", *Proceeding of the 19th International Conference on Nuclear Engineering*, ICONE19-43521
28. 2011, "An Implicit and Globally Conservative Unstructured Chimera Grid Method", *Proceeding* of *49th Aerospace Sciences Meeting and Exhibit*, Orlando, Florida, Jan. 4-7, 2011, AIAA Paper-2011-777.
29. 2011, "Computational Studies of Ejection Seat and Occupant Aerodynamics", *Proceeding of 49th Aerospace Sciences Meeting and Exhibit*, Orlando, Florida, Jan. 4-7, 2011, AIAA Paer-2011-1045.
30. 2010, "Gas Flow Simulations in Randomly Distributed Pebbles", *Proceeding of the18th International Conference on Nuclear Engineering*, May 17-21, 2010, ICONE18-29785
31. 2009, "Discrete Element Simulations of Granular Flow in a Pebble Bed Reactor", *Proceeding of* 2009 *ASME Fluids Engineering Conference*, August 2-6, 2009, Vail, Colorado, FEDSM2009-78460
32. 2009, "Implicit Time-Accurate Method for Unsteady Computations", *Proceeding of 47th AIAA Aerospace Science Meeting and Exhibit*, Florida, 5-8 January, 2009, AIAA-166
33. 2009, "Hypersonic Non-Equilibrium Computations for Ionizing Air", *Proceeding of 47th AIAA Aerospace Science Meeting and Exhibit*, Florida, 5-8 January, 2009, AIAA-1591
34. 2008, "Multi-Scale Modeling for Granular Flows", *Proceeding of 2008 ASME Fluids Engineering Conference*, August 10-14, 2008, Florida, USA. FEDSM2008-55335
35. 2007, "An Overset Chimera Unstructured Grid Method and Its Applications", *Proceeding of FEDSM2007*, 5th Joint ASME/JSME Fluids Engineering Conference, July 30-August 2, 2007, California, USA, FEDSM2007-37124
36. 2006, "A Parallelized, Dynamic Solution Adaptive, Multi-Grid, Overset Chimera Unstructured Grid Solver", *Proceeding of ASME Joint U.S.-European Fluids Engineering Summer Meeting*, InterContinental Miami, Miami, FL, July 17-20, 2006, ASMESM2006-98019.
37. 2006, "Dynamic Load Balancing for Parallel Mesh Adaptation", *Proceeding of the 10th WSEAS International Conference on Applied Mathematics*, November 1-3, 2006, Dallas, Texas, USA
38. 2004, "A Parallel Unstructured Chimera Method", *Proceeding of 42nd Annual ACM Southeast Conference*, The University of Alabama in Huntsville, Huntsville, AL, April 2-3, 2004, 301-302.