Wensi Wu

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RESEARCH INTERESTS

- Finite volume method, finite element method, volume-of-fluid method
- Computational structural dynamics, computational fluid dynamics
- Multiphysics multiphase problem, fluid-structure interaction, partitioned coupling schemes
- Scientific computing, high performance computing, numerical methods for partial differential equations

EDUCATION

Cornell University, Ithaca, New York — expected 2021
Ph.D. Candidate, Structural Mechanics
Advisor: Christopher Earls

Cornell University, Ithaca, New York — 2018
M.S., Structural Mechanics

Cornell University, Ithaca, New York — 2015
B.S., Civil Engineering | *Magna Cum Laude*

RESEARCH EXPERIENCE

Cornell University | *Graduate Research Assistant* — 2015–Present
PI: Dr. Christopher Earls

- Implemented geometric and material nonlinearity methods along with numerical dissipation strategies, into the implicit Newmark time integration solver within an open source computational structural dynamics code (CU-BEN) to support partitioned fluid-structure interaction (FSI) simulations
- Built checkpoint and restart functions within CU-BEN to enhance solution robustness in cases of hardware failure or power outages
- Programmed prescribed structure body motion subroutine within CU-BEN to enable gross spatial translations and rotations of structural members
- Updated the interface coupling library within the FSI coupled CU-BEN and OpenFOAM software to couple the interface between the fluid and structure domains of the FSI models that are subjected to prescribed structure body motion

- Performed horizontal plate free surface impact analyses using the FSI coupled CU-BEN and OpenFOAM software
- Drafting plans to use the FSI coupled CU-BEN and OpenFOAM software to validate multiple wave slamming scenarios, involving monohull and multihull geometries, in an effort to develop a generalized engineering theory of wave slamming in watercraft

Sandia National Labortaries | *Visiting Researcher* Summer 2017
Mentors: Dr. Robert Kuether, Dr. Matthew Allen, and Dr. Paolo Tiso

- Studied the dynamic response of a C-Beam model subjected to an impulse force using explicit Newmark time integration scheme
- Compared frequency response and computational time among the full and the reduced-order C-Beam models
- Implemented regularized Coulomb friction subroutine to incorporate friction calculations in contact interface of jointed structure

Cornell University | *Undergrad Research Assistant* Spring 2015–Summer 2015
Mentor: Dr. Christopher Earls

- Studied the finite volume solids solvers, mesh motion formulations, and numerical implementations within an open source computational fluid dynamics library (OpenFOAM)
- Identified ways to port CU-BEN to OpenFOAM within a partitioned, invasive context wherein CU-BEN becomes a new class within OpenFOAM C++ API library structure

Duke University | *REU Fellow* Summer 2014
Mentor: Dr. Guglielmo Scovazzi

- Compared the stabilities and the rate of convergence of a linear viscoelastic model, the Cook's membrane, using variational multi-scale stabilization (VMS) approach and compared against those without using VMS approach
- Modeled the pressure distribution around the brain subjected to explosion through FSI simulations of a blast interacting with a simplified brain model. The simplified brain model consisted of an outer elastic shell and an inner viscoelastic gell which represent the skull and the brain respectively

University of Cincinnati | *NSF REU Fellow* Summer 2013
Mentors: Dr. Margaret Kupferle, Dr. George Sorial

- Conducted experiments and performed a comparative studies between commercial activated carbon and in-house developed activated carbon
- Confirmed micropore range oligomerization control was maintained in the presence of natural organic matter
- Identified higher mesopore percentage activated carbons have a greater adsorption capacity under oxic conditions due to oligomerization

JOURNAL PUBLICATIONS

1. **W. Wu**, **C. Bonneville**, C.J. Earls, "Bayesian Optimization: Application to Fluid-Structure Interaction Problems" *(In preparation)*

2. **W. Wu**, J.W. Kosianka, H. M. Reed, C.J. Stull, and C.J. Earls (2020) "CU-BENs: A structural finite element library", SoftwareX, Vol. 11, Elsevier, pp. 1-5.

CONFERENCE PROCEEDINGS

1. P.J. Hughes, W. Scott, **W. Wu**, R.J. Kuether, M.S. Allen, and P. Tiso (2019) "Interface Reduction on Hurty/Craig-Bampton Substructures with Frictionless Contact", In: Kerschen G. (eds) Nonlinear Dynamics, Volume 1. Conference Proceedings of the Society for Experimental Mechanics Series. Springer, Cham

CONFERENCE PRESENTATIONS

1. **W. Wu** and C.J. Earls, (2019) "Tightly Coupled, Partitioned Fluid-Structure Interaction Analysis of a Horizontal Plate Impact onto a Water Free Surface: Computational Framework and Validation," 15^{th} *U.S. National Congress on Computational Mechanics,* Austin, Texas.

2. **W. Wu** and C.J. Earls, (2018) "Open Source, Tightly Coupled, Partitioned Fluid-Structure Interaction Modeling Framework for Naval Applications: The Impact of Slamming Loads on High Speed Watercraft," 13^{th} *World Congress on Computational Mechanics,* New York City, New York.

3. P.J. Hughes, W. Scott, **W. Wu**, R.J. Kuether, M.S. Allen, and P. Tiso (2018) "Interface Reduction on Hurty/Craig-Bampton Substructures with Frictionless Contact," *IMAC Annual Meeting*, Orlando, Florida.

4. **W. Wu**, J.W. Kosianka, and C.J. Earls, (2017) "Open Source, Tightly Coupled, Partitoned Fluid-Structure Interaction Simulation Capability for High Spatiotemporal Resolution During Study of Wave Impact Loads in High Speed Watercraft," 14^{th} *U.S. National Congress on Computational Mechanics,* Montreal, Canada.

5. J.W. Kosianka, **W. Wu**, and C.J. Earls, (2017) "Condition Assessment and Prognosis using Fluid-Structure Interaction within a Reduced-Order Model Tracking Inversion Framework," 14^{th} *U.S. National Congress on Computational Mechanics,* Montreal, Canada.

OTHER PRESENTATIONS/WORKSHOPS

1. J.W. Kosianka, **W. Wu**, and C.J. Earls, (2017) "Introduction to CU-BEN: Theoretical Overview and Tutorials," *Cornell University CU-BEN Workshop*, Cornell University, Ithaca, New York.

2. **W. Wu**, (2013) "Influence of Activated Carbon Pore Size Distribution on the Removal of Water Contaminants," *Diversity in Scholarship and Engagement Symposium*, Cornell University, Ithaca, New York.

TEACHING EXPERIENCE

Cornell University | *Teaching Assistant* Spring 2019
CEE 4740: Introduction to The Behavior of Metal Structures

Cornell University | *Teaching Assistant* Spring 2018
CEE 4780/6780: Structural Dynamics and Earthquake Engineering

Syracuse University | *Academic Excellence Workshops Facilitator* 2012–2013
MATH 295: Calculus I
MATH 296: Calculus II

HONORS AND AWARDS

Ve-Sing and Tseng So Koo Award: awarded to an outstanding student of structural engineering in Civil and Environmental Engineering who is planning to pursue graduate studies at Cornell University. 2015

NSF Sponsored Research Experiences for Undergraduates Best Overall Project: awarded to the student project team with the highest score on project poster, technical report, and final presentation. 2013

PROFESSIONAL MEMBERSHIPS

United States Association for Computational Mechanics (USACM)
International Association on Computational Mechanics (IACM)
Tau Beta Pi National Engineering Honor Society
Chi Epsilon National Civil Engineering Honor Society
American Society of Civil Engineers (ASCE)

LEADERSHIP EXPERIENCE

Cornell University CEE Graduate Student Association 2020–2021
Vice President

Cornell University Sport Taekwondo Student Club 2019–2020
Treasurer

Cornell University Engineering Teaching Assistant Development Program 2018–2019
TA Development Consultant

Cornell University CEE Graduate Student Association 2016–2017
Treasurer

Chi Epsilon National Civil Engineering Honor Society 2014–2015
Treasurer