Hexiang Wang

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Education

University of California Davis (GPA 4.0/4.0, Half courses $A+$) **California, USA**
PhD, Geotechnical Engineering *2016 -*

University of California Davis (GPA 4.0/4.0) **California, USA**
Master, Applied Mathematics *2017 -*

Tongji University (GPA 4.91/5.0 Ranking 1/506) **Shanghai, China**
Bachelor, Civil Engineering *2012 - 2016*

Research Experience

Time Domain Intrusive Stochastic Framework for Seismic Risk Analysis
Advisors: Prof. Boris Jeremic and Prof. Norman Abrahamson, UC Davis *2018 -*

The established framework facilitates the transition of performance based earthquake engineering from ergodic, spectrum acceleration based, frequency domain, Monte Carlo driven methodology to nonergodic, Fourier spectrum based, time domain, intrusive methodology.

Earthquake Soil Structure Interaction with 3D Inclined Seismic Wave Field
Advisor: Prof. Boris Jeremic, UC Davis *2018 -*

Spatially varying, inclined 3D wave field comprising both body waves and surface waves are solved with wave potential approach. Effects of 3D seismic excitations on soil structure interaction system and modeling uncertainties of conventional 1D wave field assumption are revealed and clarified.

Earthquake Soil Structure Fluid Interaction
Advisor: Prof. Boris Jeremic, UC Davis *2017 - 2018*

Euler-Lagrangian description for earthquake soil structure fluid interaction (SSFI) is formulated with coupled finite element - finite volume method. Assuming small structural deformation, modified Volume of Fluid approach with localized mesh updating is proposed for solid fluid interface modeling. The algorithm is implemented in Real-ESSI Simulator, validated with experiments and applied for dynamic modeling of dams and nuclear reactors.

Nonlinear Earthquake Soil Structure Interaction Modeling for Nuclear Power Plants
Advisor: Prof. Boris Jeremic, UC Davis *2016 - 2017*

Realistic 3D ground motions are developed from regional broadband physics-based earthquake modeling. Under these 3D seismic excitations, dynamic response of nonlinear soil structure interaction system is studied. High fidelity nonlinear modeling of soil and soil-structure interface is emphasized.

Statistical and Probabilistic Study on Defects of Road Tunnels in China
Advisors: Prof. Hongwei Huang and Prof. Dongming Zhang, Tongji University *2015 - 2016*

Database for crack and leakage defects of road tunnels in China is built. Key factors for defects in road tunnels are reveled from statistical analysis. Probabilistic models of defects are established.

Teaching Experience

Teaching Assistant

ENG 104 Lab: Mechanics of Materials
Course Instructor: Prof. Rob Y.H. Chai *Spring 2018*
Organized 1 hour lectures and labs for 10 people; Reports grading; Held office hours

Readership

ENG 104: Mechanics of Materials
Course Instructor: Prof. Boris Jeremic *Fall 2018*
Homework and Examination grading

Professional Experience

Research Assistant, University of California at Davis *Sep 2016 -*

- Research project on "A Modern Computational Framework for the Nonlinear Seismic Analysis of Nuclear Facilities and Systems "

Intern, East China Architectural Design & Research Institute Co. Ltd *Dec 2015 - Jan 2016*

- Steel structure design of boarding bridges for satellite concourse of Shanghai Pudong International Airport
- Design drawing with AutoCAD and drawing inspection

Visiting Scholar, The University of Hong Kong *Jul 2015 - Aug 2015*

- Investigated the cause of rockburst supervised by Prof. Zhongqi Yue (HKU)
- Studied tensile-shearing failure of soil and its implication in slope stability

Intern, China Railway 17th Bureau Group Co., Ltd, Xiamen, China *Jun 2015 - Jul 2015*

- Participated in the construction of Xiamen Metro line No. 1
- Performed numerical simulation with FLAC on ground subsidence and its influence on nearby Wenyuan bridge caused by tunnel excavation
- Structural safety analysis of steel support system for subway station excavation

Intern, College of Civil Engineering, Tongji University *Jun 2014 - Aug 2014*

- Geological field investigation in Hangzhou, China
- Survey practice and topographic map drawing
- Concrete structure design of floor, stairs, underpass and lining of shield tunnel

Honors and Awards

Elected to Phi Kappa Phi Honor Society, top 7.5%, UC Davis *Mar 2018*
Outstanding Graduates Awards, Shanghai Municipal People's Government *Jun 2016*
National Scholarship, Ministry of Education of the People's Republic of China *Oct 2015*
HKU Civil Centennial Future Scholars The University of Hong Kong *Aug 2015*
Outstanding Student Scholarship Tongji University, awarded 2 times *Jun 2014/2015*
The First Class Guolong Han Scholarship, Tongji University *Oct 2014*
National Scholarship, Ministry of Education of the People's Republic of China *Oct 2013*
The First Prize Scholarship, top 5%, Tongji University, awarded 3 times *Oct 2013/2014/2015*

Professional Qualification and Affiliations

Engineering-In-Training (EIT) in the state of California

Student Member of Earthquake Engineering Research Institute (EERI)

Member of Geotechnical Graduate Student Society at UC Davis

Publications

Books

1. Boris Jeremic, Zhaohui Yang, Zhao Cheng, Guanzhou Jie, Nima Tafazzoli, Matthias Preisig, Panagiota Tasiopoulou, Federico Pisano, Jose Abell, Kohei Watanabe, Yuan Feng, Sumeet Kumar Sinha, Fatemah Behbehani, Han Yang, and **Hexiang Wang**. Nonlinear Finite Elements: Modeling and Simulation of Earthquakes, Soils, Structures and their Interaction. University of California, Davis, CA, USA; and Lawrence Berkeley National Laboratory, Berkeley, CA, USA, 1989-2018. ISBN: 978-0-692-19875-9 (PDF)

Papers in Referred Journals

10. **Hexiang Wang**, Fang Wang, Jeff Bayless, Han Yang, Yuan Feng, Marco Baglio, Norman A. Abrahamson and Boris Jeremic. Time Domain Intrusive Stochastic Seismic Risk Analysis using Ground Motion Prediction Equations of Fourier Amplitude Spectra. In Review, *Earthquake Spectra.* 2019
9. **Hexiang Wang**, Han Yang, Yuan Feng, Fangbo Wang, and Boris Jeremic. Wave Potential-Domain Reduction Method for 3D Earthqauke Soil Structure Interaction. In Review, *Soil Dynamics and Earthquake Engineering.* 2019.
8. **Hexiang Wang**, Fangbo Wang, Han Yang, Yuan Feng, Jeff Bayless, Marco Baglio, Norman A. Abrahamson, and Boris Jeremic. Time Domain Intrusive Stochastic Framework for Seismic Risk Analysis. In Review, *Earthquake Engineering and Structural Dynamics.* 2019.
7. Fangbo Wang, **Hexiang Wang**, Han Yang, Yuan Feng, and Boris Jeremić. Modular Time Domain Intrusivce Stochastic Seismic Wave Propagation with Uncertain Heterogenous Solids. In Review, *Computer Methods in Applied Mechanics and Engineering.* 2019
6. Han Yang, **Hexiang Wang**, and Boris Jeremic. A Modern Energy-Based Design Framework for Soil Structure Interaction System. In Preparation, 2019.
5. Han Yang, Yuan Feng, **Hexiang Wang** and Boris Jeremić. Energy Dissipation Analysis for Inelastic Reinforced Concrete and Steel Beam-Columns. In Revision, *Engineering Structures,* 2019.
4. Han Yang, **Hexiang Wang**, Yuan Feng, and Boris Jeremic. Plastic energy dissipation in pressure-dependent materials. In Revision, *ASCE Journal of Engineering Mechanics.* 2019.
3. Yuan Feng, Kaveh Zamani, Han Yang, **Hexiang Wang**, Fangbo Wang, and Boris Jeremic. Procedure to Build Trust in Nonlinear Elastoplastic Integration Algorithm: Solution and Code Verification. Accepted, *Engineering with Computers,* 2018.
2. Han Yang, **Hexiang Wang**, Yuan Feng, Fangbo Wang and Boris Jeremic. Energy Dissipation in Solids due to Material Inelasticity, Viscous Coupling, and Algorithmic Damping. In Print, *ASCE Journal of Engineering Mechanics,* 2018.
1. **Hexiang Wang**, Hongwei Huang, Yuan Feng and Dongming Zhang. Characterization of Crack and Leakage Defects of Concrete Linings of Road Tunnels in China. *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering,* 4(4), 2018

Proceedings of Referred Conferences

11. **Hexiang Wang**, Yuan Feng, Han Yang, Fangbo Wang, and Boris Jeremic. Stress Test Seismic Motions for Nuclear Installations. *Abstract Accepted for the 25th Structural Mechanics in Reactor Technology (SMiRT) Conference.* Charlotte, North Carolina, USA. August 04-09, 2019.
10. **Hexiang Wang**, Fangbo Wang, Han Yang, Yuan Feng, Jeff Bayless, Marco Baglio, Norman A. Abrahamson, and Boris Jeremic. Time Domain Intrusive Stochastic Seismic Risk Analysis Framework for Nuclear Installations. *Abstract Accepted for the 25th Structural Mechanics in Reactor Technology (SMiRT) Conference.* Charlotte, North Carolina, USA. August 04-09, 2019.
9. Han Yang, Yuan Feng, **Hexiang Wang**, Fangbo Wang, and Boris Jeremic. Seismic energy flow calculation for Earthquake Soil Structure Interaction System. *Abstract Accepted for the 25th Structural Mechanics in Reactor Technology (SMiRT) Conference.* Charlotte, North Carolina, USA. August 04-09, 2019.
8. Fangbo Wang, **Hexiang Wang**, Han Yang, Yuan Feng, and Boris Jeremic. Stochastic Earthquake Soil Structure Interaction Analysis. *Abstract Accepted for the 25th Structural Mechanics in Reactor Technology (SMiRT) Conference.* Charlotte, North Carolina, USA. August 04-09, 2019.
7. Boris Jeremic, Yuan Feng, Han Yang, **Hexiang Wang**, Fangbo Wang, and David B. McCallen. The MS-ESSI Simulator System, Current Status. *Abstract Accepted for the 25th Structural Mechanics in Reactor Technology (SMiRT) Conference.* Charlotte, North Carolina, USA. August 04-09, 2019.
6. Yuan Feng, Sumeet Kumar Sinha, Han Yang, **Hexiang Wang**, David B McCallen, and Boris Jeremic. 3D nonlinear Earthquake Soil Structure Interactions (ESSI) for Nuclear Power Plants (NPP). *In Proceedings of the 11th U.S. National Conference on Earthquake Engineering (NCEE).* Los Angeles, California, USA. June 25-29, 2018.
5. Han Yang, Yuan Feng, Sumeet Kumar Sinha, **Hexiang Wang**, and Boris Jeremic. Energy Dissipation in Soil Structure Interaction System. *In Proceedings of the 5th Geotechnical Earthquake Engineering and Soil Dynamics (GEESD).* Austin, Texas, USA. June 10-13, 2018.
4. Boris Jeremic, Yuan Feng, Han Yang, **Hexiang Wang**, Dragan Kovacevic, Arthur Rodgers, and David B McCallen. Interface Between Earthquake Ground Motions and Structural Response: Numerical Modeling and Simulation of ESSI Behavior. *In Proceedings of Best Practices in Physics-based Fault Rupture Models for Seismic Hazard Assessment of Nuclear Installations: Issues and Challenges towards Full Seismic Risk Analysis.* Cadarache Chateau, France. May 14-16, 2018.
3. Sumeet Kumar Sinha, Yuan Feng, Han Yang, **Hexiang Wang**, and Boris Jeremic. 3-D Nonlinear Modeling and Its Effects in Earthquake Soil-Structure Interaction. *In Proceedings of the 24th Structural Mechanics in Reactor Technology (SMiRT) Conference.* Busan, Korea. August 20-25, 2017.
2. **Hexiang Wang**, Han Yang, Sumeet Kumar Sinha, Chao Luo, and Boris Jeremic. 3-D Nonlinear Earthquake Soil-Structure Interaction Modeling of Embedded Small Modular Reactor (SMR). *In Proceedings of the 24th Structural Mechanics in Reactor Technology (SMiRT) Conference.* Busan, Korea. August 20-25, 2017.
1. Yuan Feng, Jose Abell, Sumeet Kumar Sinha, Han Yang, Fatemah Behbehani, **Hexian Wang**, Nebojsa Orbovic, David B McCallen and Boris Jeremic. Verification for the Real ESSI Simulator. *In proceedings of the 24th Structural Mechanics in Reactor Technology (SMiRT) Conference.* Busan, South Korea, August 20-25, 2017.

Technical Reports, Theses and Other Major Publications

4. **Hexiang Wang**. Earthquake Soil Structure Fluid Interaction (SSFI) for Nuclear Facilities. University of California, Davis, September 2017.

3. Jose Abell, Yuan Feng, Sumeet Kumar Sinha, Han Yang, **Hexiang Wang** and Boris Jeremic. Real ESSI Simulator Domain Specific Language (DSL). UCDCompGeoMech022017. (PDF)
2. Sumeet Kumar Sinha, Yuan Feng, **Hexiang Wang** and Boris Jeremić. Real-ESSI Simulator Model Development and Mesh Generator Manual. University of California, Davis, 2017. (PDF)
1. **Hexiang Wang.** The Investigation and Statistical Analysis of Safety Characteristic Parameters for Road Tunnels and Bridges in Seasonally Frozen Regions. *Bachelor's Thesis,* Tongji University, Shanghai, China. June 2016.

Softwares Applications Developed/Contributed

Real ESSI Simulator System: High performance, high fidelity, multi-physics FEM simulator for **Real**istic modeling & simulations of **E**arthquakes, and **S**oils, and **S**tructures and their **I**nteraction. Contributed to the solid fluid interaction and 3D seismic wave field modeling. (Program)

SW42ESSI: Developed interface program between regional broadband earthquake motion simulator SW4 and RealESSI based on Domain Reduction Method. (Program)

SSFI: Developed C++ library for **S**oil **S**tructure **F**luid **I**nteraction simulation based on modified Volume of Fluid method. (Program)

gmFoam: Developed integrated mesh conversion tool, which transforms general Gmsh mesh partly (solid part) into FEM (finite element method) mesh and partly (fluid part) into FVM (finite volume method) mesh to perform earthquake soil structure fluid interaction analysis.(Program)

Shaker2018: Developed program that could perform near site 1D and 3×1D wave convolution and deconvolution, 3D plane wave propagation analysis based on propagator matrix technique.

HAZ45: Probabilistic seismic hazard analysis program originally developed by Prof. Norman Abrahamson. Contributed to earthquake scenarios info output from seismic source characterization. (Program)