Wen-Huai Tsao, Ph.D.

Department of Civil and Environmental Engineering, Louisiana State University

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Education

Ph.D. – Civil Engineering | National Taiwan University | January 2018

Dissertation: Study on nonlinear liquid sloshing behavior and its application on tuned liquid damper by regularized boundary integral method

Advisor: Dr. Yung-Hsiang Chen and Dr. Wei-Shien Hwang

B.S. – Civil Engineering | National Taiwan University | June 2009

Publications

1. **Tsao, W.H.,** Chen, Y.C., Kees, C.E., Manuel, L. (2022). Response mitigation of floating platform by porous-media tuned liquid dampers, *Journal of Ocean, Offshore and Arctic Engineering*, (Under Review).

2. **Tsao, W.H.,** Chen, Y.C., Kees, C.E., Manuel, L. (2022). The effect of porous media on wave-induced sloshing in a floating tank, *Applied Sciences,* 12(11), 5587.

3. **Tsao, W.H.,** Huang, L.H. and Hwang, W.S. (2021). An equivalent mechanical model with nonlinear damping for sloshing rectangular tank with porous media. *Ocean Engineering*, 242, 110145.

4. **Tsao, W.H.** and Kinnas, S.A. (2021). Local simulation of sloshing jet in a rolling tank by viscous-inviscid interaction method. *Results in Engineering*, 11, 100270.

5. **Tsao, W.H.** and Huang, Y.L. (2021). Sloshing force in a rectangular tank with porous media. *Results in Engineering*, 11, 100250.

6. **Tsao, W.H.** and Chang, T.J. (2020). Sloshing phenomenon in rectangular and cylindrical tanks filled with porous media: supplementary solution and impulsive-excitation experiment. *Journal of Engineering Mechanics*, 146(12), 04020139.

7. **Tsao, W.H.** and Kinnas, A.S. (2020). Local study of jet of a fluid sloshing inside a rolling tank. *Proceedings of the ASME 39th International Conference on Ocean, Offshore and Arctic Engineering*, Fort Lauderdale, USA.

8. **Tsao, W.H.** and Kinnas, A.S. (2020). Numerical simulation of fluid sloshing in a rolling tank. *25th SNAME Offshore Symposium*, Houston, USA.

9. **Tsao, W.H.** and Hwang, W.S. (2019). Dynamic characteristics of liquid sloshing in cylindrical tanks filled with porous media. *IOP Conference series: Earth and Environmental Science*, 351, 012007.

10. **Tsao, W.H.** and Hwang, W.S. (2018). Tuned liquid dampers with porous media. *Ocean Engineering*, 167(1), 55-64.

11. Chen, Y.H., Hwang, W.S. and **Tsao, W.H.** (2018). Nonlinear dynamic characteristics of rectangular and cylindrical TLD's. *Journal of Engineering Mechanics*, 144(9), 06018004.

12. **Tsao, W.H.** and Hwang, W.S. (2017). Regularized boundary integral methods for three–dimensional potential flows. *Engineering Analysis with Boundary Elements*, 77, 49-60.

13. Chen, Y.H., Hwang, W.S. and **Tsao, W.H.** (2017). Nonlinear sloshing analysis by regularized boundary integral method. *Journal of Engineering Mechanics*, 143(8), 040170046.

Conference Presentation

1. **Tsao, W.H.** and Kees, C.E. (2022). An improved boundary integral equation method with arbitrary Lagrangian-Eulerian approach for nonlinear wave-bottom interaction problems. *American Geophysical Union Fall Meeting*, Chicago, USA.

2. **Tsao, W.H.** and Kees, C.E. (2022). Arbitrary Lagrangian-Eulerian method in finite-element model for nonlinear wave-bottom interaction, *8th Young Coastal Scientists and Engineers Conference*, Pensacola, USA.

3. **Tsao, W.H.**, Chen, Y.C., Kees, C.E., Manuel, L. (2022). Response mitigation of floating platform by porous-media tuned liquid dampers, *Proceedings of the ASME 2022 41st International Conference on Ocean, Offshore and Arctic Engineering*, Hamburg, Germany.

4. Kees, C.E., Tovar, E., Schurr, R., and **Tsao, W.H.** (2021). High-performance computational models of non-hydrostatic water waves over complex bathymetry. *American Geophysical Union Fall Meeting*, New Orleans, USA.

5. **Tsao, W.H.** (2019). Dynamic characteristics of liquid sloshing in cylindrical tanks filled with porous media. *International Conference on Advances in Civil and Ecological Engineering Research*, Kaohsiung, Taiwan.

6. **Tsao, W.H.** and Chang, C.M. (2018). New numerical integration method for dynamic systems with high nonlinearity. *The 14th National Conference on Structural Engineering/The 4th National Conference on Earthquake Engineering*, Taichung, Taiwan.

7. **Tsao, W.H.** and Hwang, W.S. (2018). Study on nonlinear sloshing problem. *30th Taiwan SNAME and MOST Symposium*, Taipei, Taiwan.

8. **Tsao, W.H.** (2018). Analysis on porous-media tuned liquid damper for vibrational control in flexible structures. *Proceedings of the 40th Ocean Engineering Conference*, Kaohsiung, Taiwan.

9. **Tsao, W.H.** and Hwang, W.S. (2017). The analysis of regularized boundary integral methods for a non-smooth body in potential flows. *29th Taiwan SNAME and MOST Symposium*, Taipei, Taiwan.

10. **Tsao, W.H.** and Hwang, W.S. (2016). The analysis of regularized boundary integral methods for an oblate body in potential flows. *28th Taiwan SNAME and MOST Symposium*, Taipei, Taiwan.

Patents

1. **Wen-Huai Tsao** and Wei-Shien Hwang. "*Tuned Liquid Dampers with Porous Media*," Japan Patent #3217982, issued August 22, 2018.

2. **Wen-Huai Tsao** and Wei-Shien Hwang. "*Tuned Liquid Dampers with Porous Media*," China Patent #ZL20182 0503987.2, issued January 18, 2019.

3. **Wen-Huai Tsao** and Wei-Shien Hwang. "*Tuned Liquid Dampers with Porous Media*," Taiwan Patent #M564058, issued July 21, 2018.

Honors & Awards

▪ Southeastern Conference Emerging Scholar, Louisiana State University, USA, 2021
▪ Postdoctoral Research Abroad Scholar, Ministry of Science and Technology, Taiwan, 2019

Expertise and Skill

Civil and Ocean Engineering

▪ Fluid-structure/solid interaction; Vibration control technology; Shaking table testing
▪ Computational fluid dynamics; Free-surface calculation

Program Development

▪ Experience on code developments with **Fortran** and **MATLAB**
▪ Experience on code developments of open-source toolkit **Proteus** (**Python**)

Scientific Toolkits

▪ Experience on **Fluent** (CFD), **Tecplot 360, Praview** (post-processing), **EDEM** (granular material)
▪ Exposure to **SACS** (offshore), **OpenFAST** (wind turbine), **CHRONO** (multibody dynamics)
▪ Linux, Mathematica, AutoCAD, LabVIEW

Professional Experience

Postdoctoral Researcher | 2021 – Present

Department of Civil and Environmental Engineering, Louisiana State University

Advisor: Dr. Christopher Kees

▪ Develop high-performance CFD algorithms for multiphase Navier-Stokes and potential flow models for free-surface waves and fluid-structure interaction simulations

▪ R&D vibration controller for floating structure and offshore wind turbine

Visiting Scholar/Researcher | 2019 – 2021

Department of Civil, Architectural and Environmental Engineering, The University of Texas at Austin

Advisor: Dr. Spyros A. Kinnas

▪ Develop new viscous-inviscid interaction algorithm for high-resolution local sloshing simulation. Superior efficiency is gained

▪ Invent the innovative tuned liquid damper with porous media for structural control and obtained international patents in Japan, China, and Taiwan

Postdoctoral Research Fellow | 2018 – 2019

Department of Bioenvironmental System Engineering, National Taiwan University

Advisor: Dr. Tsang-Jung Chang

▪ Deliver full-scale numerical simulation for fracture procedure of riverine levee breach in flood by coupling CFD-DEM algorithm

Postdoctoral Research Fellow | 2018

Department of Civil Engineering, National Taiwan University

Advisor: Dr. Chia-Ming Chang

▪ Design track-TMD system to resist seismic and blast loads and lead a team to conduct large-scale shaking-table experiments

Graduate Research Assistant | 2010 – 2018

Department of Engineering Science and Ocean Engineering, National Taiwan University

Advisor: Dr. Wei-Shien Hwang

▪ Characterize nonlinear sloshing behavior and effectiveness of TLD on structural vibration control

▪ Develop new BEM schemes to improve numerical accuracy, stability, and efficiency

Invited Talks

▪ Department of Civil and Environmental Engineering Seminar, LSU in September 2022

▪ Proteus Workshop, LSU Center for River Studies in July 2021

▪ Ocean Engineering Group Seminar, UT Austin in June 2021, January 2021, June 2020, January 2020

▪ Environmental and Water Resources Engineering Group Seminar, UT Austin in September 2020, February 2020

Journal Reviewer

▪ Mechanical Systems and Signal Processing

▪ Structures

▪ Ocean Engineering

▪ Engineering Computations

▪ Marine Pollution Bulletin

Teaching Tendency

Undergraduate Courses

Structural theory; Fluid mechanics; Ocean engineering

Graduate Courses

Dynamics of structures; Structural control theory; Computational methods for potential flows

Teaching Experience

Guest Lecturer | CE7430 Structural Design for Dynamic Loads | spring 2022

Department of Civil and Environmental Engineering, Louisiana State University

▪ Lecture 1 course on passive structural control theory: tuned mass damper and tuned liquid damper

Guest Lecturer | CE7700 Computational Methods for Coastal and Riverine Mechanics | spring 2022

Department of Civil and Environmental Engineering, Louisiana State University

▪ Lecture 2 courses on boundary element method for potential flows

Guest Lecturer | CIE1013 Applied Mechanics | spring 2018

Department of Civil Engineering, National Taiwan University

▪ Lecture 2 courses on statics includes dry friction force on flat belt, wedge, pivot, etc.

Teaching Assistant | CIE5058 Railway Engineering | spring 2011, spring 2013

Department of Civil Engineering, National Taiwan University

▪ Introduce fundamentals of railway dynamics and host weekly office hours

Teaching Assistant | ESOE5045 Dynamics of Structures | fall 2010, fall 2011

Department of Engineering Science and Ocean Engineering, National Taiwan University

▪ Host weekly office hours and topic review sessions

Additional Information

Citizenship: Taiwan

Languages: Mandarin Chinese (native), English (fluent)

YMCA basketball volunteer coach

References

Christopher E. Kees | CSRS Distinguished Professor | Principal investigator

Department of Civil and Environmental Engineering, Louisiana State University

cekees@lsu.edu | (225) 578-4467

Lance Manuel | Professor | Collaborator

Department of Civil, Architectural and Environmental Engineering, The University of Texas at Austin

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Wei-Shien Hwang | Professor | Dissertation advisor

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