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). The effect of porous media on wave-induced sloshing in a floating tank, *Applied Sciences,* 12(11), 5587.
2. **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.
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. 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.
2. **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.
3. **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.
4. **Tsao, W.H.** and Hwang, W.S. (2018). Study on nonlinear sloshing problem. *30th Taiwan SNAME and MOST Symposium*, Taipei, Taiwan.
5. **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.
6. **Tsao, W.H.** and Hwang, W.S. (2017). The analysis of regularized boundary integral methods for a nonsmooth body in potential flows. *29th Taiwan SNAME and MOST Symposium*, Taipei, Taiwan.
7. **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

- 8+ years' 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** (post-processing), **EDEM** (granular material)
- Exposure to **SACS** (offshore), **OpenFAST** (wind turbine), **CHRONO** (multibody dynamics)
- Mathematica, AutoCAD, LabVIEW

Professional Experience

2-YEAR POSTDOCTORAL RESEARCHER | 2021 – PRESENT

Department of Civil and Environmental Engineering, Louisiana State University

Advisor: Dr. Christopher Kees

- Develop high-performance CFD solver based on multiphase Navier-Stokes and potential flow models for fluid-structure interaction simulation
- Develop vibration absorber for wind turbine in ocean environments

VISITING SCHOLAR | 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 local sloshing simulation to gain superior efficiency than commercial software
- 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

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 improved BEM scheme to higher numerical accuracy, stability, and efficiency

Invited Talks

- *Sloshing modeling and porous-media TLD by RBIM*, Proteus Workshop, LSU, July 2021
- *Viscous-inviscid interaction method*, Ocean Engineering Group Seminar, UT Austin, June 2021
- *Local behavior of free jet in tank*, Ocean Engineering Group Seminar, UT Austin, January 2021
- *Porous-media tuned liquid damper*, Environmental and Water Resources Engineering Seminar, UT Austin, September 2020
- *Modeling sloshing in rolling tank*, Ocean Engineering Group Seminar, UT Austin, June 2020
- *Sloshing and tuned liquid damper*, Environmental and Water Resources Engineering Seminar, UT Austin, February 2020
- *Regularized panel method formulation*, Ocean Engineering Group Seminar, UT Austin, January 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; Boundary element method 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

Professor Christopher E. Kees (Principal investigator)

Department of Civil and Environmental Engineering, Louisiana State University

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

Professor Wei-Shien Hwang (Dissertation advisor)

Department of Engineering Science and Ocean Engineering, National Taiwan University

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