Zibo Liu

Last updated on: January 4, 2022

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RESEARCH FIELD, EXPERTISE AND SKILLS

Keywords (expertise): **"vibroacoustics; aeroacoustics; acoustic simulation; acoustic metamaterials/phononic crystal; waves; sound insulation and absorption; sound radiation; structural analysis; finite element method; signal analysis, acoustic measurement; machine learning; phonon (condensed matter physics)"**

Keywords (skills): **"Matlab; Python; COMSOL; TensorFlow; Latex; *Open-source dependencies*; CAE; MS Office"**

Specialized in CAE (FEA) in Acoustics, NVH control and Acoustic Measurement. Interested in exploiting acoustic metamaterials for practical applications and machine learning technology in order to solve real-world problems in different fields of mechanical engineering.

EDUCATION

09/2014 – 04/2019 **PhD in Engineering Acoustics**
STOCKHOLM, SWEDEN
Department of Aeronautical and Vehicle Engineering (AVE) (Now Institutionen för Teknisk Mekanik)
KTH Royal Institute of Technology

09/2011 – 06/2014 **MSc in Theoretical Acoustics**
CHANGSHA, CHINA
National University of Defense Technology

09/2007 – 06/2011 **BE in Applied Mechanics and BBA in Business Administration**
BEIJING, CHINA
Beijing Institute of Technology

PROFESSIONAL EXPERIENCE

05/2021 – PRESENT **Postdoctoral researcher in Mechanical Engineering**
BEIJING, CHINA
Department of Mechanical Engineering, Tsinghua University

12/2018 – 04/2021 **Research Engineer and Project Consultant in Acoustics**
STOCKHOLM, SHANGHAI AND BEIJING
See more details in the following section

DETAILED PROFESSIONAL/PROJECT EXPERIENCE

05/2021 – PRESENT (100%)

Department of Mechanical Engineering, Tsinghua University

Postdoctoral researcher

Project supervisor: Associate Prof. Dameng Liu

Responsibilities: It is one of the cutting-edge challenges to understand the nanofrictional properties of materials and is of great significance to a sustainable society. I am leading a small group of two PhD students, under the supervision of associated professor Dameng Liu at the State Key Laboratory of Tribology Tsinghua University, to conduct the research on the phonon properties of low-dimensional materials. My responsibilities include:
1, To identify the energy dissipation channel via phonons, and to develop the comprehension of the origin of nanofriction, paving a way for the control of frictional properties in tailored 2D materials based on phonon engineering.
2, Leading weekly group discussions and co-advising junior postgraduate students.

07/2020 – 04/2021 (20%)

Department of Mechanical Engineering, Tsinghua University

External researcher

Reference: Associate Prof. Dameng Liu

Responsibilities: This project is funded by WEICHAI POWER CO., LTD, an engine developer in China. The Objective is to improve the tribological behaviour of a diesel engine by improving its sealing performance.

09/2020 – 04/2021 (20%)

School of Materials, Sun Yat-sen University, Guangzhou, China

External researcher

Reference: Prof. Bin Li (Dean of the School)

Responsibilities: Exploiting the application potentials of acoustic metamaterials. In particular, reviewing the research on the acoustic angular momentum enabled by the acoustic metamaterial, exploring the possibilities of improving the efficiency of underwater acoustic communication via metamaterial concept. Responsibilities include:
1, Bi-weekly discussions and literature review related to acoustic metamaterials.
2, Submitting monthly report with respect to the recent development in the literature of acoustic metamaterials to Professor Bin Li, who is an expert in electromagnetic metamaterials.

12/2019 – 04/2021 (20%)

Institute of Acoustics, Tongji University, Shanghai, China

Research engineer

Reference: Associate Prof. Wuzhou Yu

Responsibilities: I developed the theoretical and numerical models of a multi-layered system for the estimation of its acoustic properties. The theoretical model is an acoustic-wave-based approach (transfer matrix method). The numerical model is based on the finite element method conducted in COMSOL. These models laid a foundation for the evaluation of the acoustic properties of a pipeline-jacket system in a nuclear power plant in China. I also took part of the responsibilities for a master thesis project that emerged from this topic.

07/2019 – 01/2021 (80%)

Yi Duo Information Technology Co., Ltd. (Shanghai), Shanghai, China

Acoustic consultant, Project manager

Reference: CEO Dr. Qi Li

Responsibilities: I am working as a project manager/coordinator and acoustic consultant for the Project SAFES (Simulation package of the Acoustic properties For the thErmal insulation Structures) – a sub project of the NATIONAL SCIENCE AND TECHNOLOGY MAJOR PROJECT under the Project Number ZD08-212-002-002, funded by Ministry of Science and Technology of China. The Objective of this project is to develop a pipeline jacket in order to achieve integrated function of thermal insulation and noise reduction for a nuclear power plant. This is an 18-month joint project between Tongji University, Yi Duo Tech., and Shanghai Nuclear Engineering Research and Design Institute. My responsibilities include:
1, Define reasonable work packages and tasks in order to conduct the project;
2, Develop theoretical and numerical models for the acoustic estimation (in collaboration with Institute of Acoustics, Tongji University);
3, Project management tasks, e.g., coordinating and co-organizing project review meetings between the three bodies;
4, Submit monthly reports to the project funders and co-organizing the checkpoint meetings for the funders.

09/2014 – 06/2019 (100%)

KTH Royal Institute of Technology, Stockholm, Sweden

Research engineer and Postgraduate Researcher (PhD student)

Supervisors: Associate Prof. Leping Feng and Dr. Romain Rumpler

Projects in my PhD:
1, *Design of lightweight (meta-)materials with tailored acoustic functionalities for on-demand engineering purposes* (09/2015 – 06/2019). Investigate and the acoustic properties of metamaterial acoustic panels in order to spark the application potentials in sound insulation/absorption and vibration isolation engineering; laboratory assistant at the Marcus Wallenberg Laboratory for Sound and Vibration Research (MWL).
2, *Analysis and design of sandwich structures* (10/2018 – 02/2019). The project aims at investigating and improving the sound transmission loss properties of sandwich structures. A solution is proposed to the coincidence effect of sandwich structures.
3, *Roll2Rail Project* (09/2016 – 03/2017). The Roll2Rail project aims to develop key technologies for radical innovation in the field of railway vehicles. As part of this project, and in collaboration with HITACHI RAIL ITALY, I simulated the sound transmission loss properties of the cabin of a train under the supervision of Dr. Romain Rumpler.
4, *Analysis of the acoustic properties of porous materials* (09/2015 – 01/2016). Biot's theory for porous materials was studied through the project. A theoretical basis for the design of the core materials of sandwich structures is consolidated.
5, *Structural analysis of a vehicle driveline system* (01/2015 – 05/2015). The modal analysis of a GKN driveline was performed. The corresponding eigenmodes and eigenfrequencies of the structure were predicted theoretically and then tested experimentally.

SCIENTIFIC PUBLICATIONS

Journals

1. **Liu, Z.**, Rumpler, R. and Feng, L., 2021. Locally resonant metamaterial curved double wall to improve sound insulation at the ring frequency and mass-spring-mass resonance. *Mechanical Systems and Signal Processing*, *149*, p.107179. doi: 10.1016/j.ymssp.2020.107179

2. **Liu, Z.**, Rumpler, R. and Feng, L., 2019. Investigation on sound transmission through a locally resonant metamaterial cylindrical shell. *Journal of Applied Physics*, *125*, 115105(2019). doi: 10.1063/1.5081134

3. Song, Y., Feng, L., **Liu, Z.**, Wen, J. and Yu, D., 2019. Suppression of the vibration and sound radiation of a sandwich plate via periodic design. *International Journal of Mechanical Sciences*, *150*, pp.744-754. doi: 10.1016/j.ijmecsci.2018.10.055

4. **Liu, Z.**, Rumpler, R. and Feng, L., 2018. Broadband locally resonant metamaterial sandwich plate for improved noise insulation in the coincidence region. *Composite Structures*, *200*, pp.165-172. doi: 10.1016/j.compstruct.2018.05.033

****5.*** **Liu, Z.**, *et al*, 2021. Theoretical and experimental study of sound insertion loss of a multilayer pipeline jacket.

****6.*** **Liu, Z.**, *et al*, 2021. Improve the sound transmission loss of curved sandwich panel by simultaneously overcoming the ring frequency and coincidence effects.

* *to be submitted*

Conference papers

7. **Liu, Z.**, Yu, W., & Li, Q. (2021). Design of curved sandwich panel to overcome the ring frequency and coincidence effects. Paper presented at the "Advances in Acoustics, Noise and Vibration - 2021" Proceedings of the 27th International Congress on Sound and Vibration, ICSV 2021.

8. **Liu, Z.**, Romain Rumpler, and Leping Feng. "Investigation on the acoustic behaviour of a locally resonant metamaterial curved panel." In 25th International Congress on Sound and Vibration 2018, vol. 6, pp. 3409-3416. 2018.

9. **Liu, Z.**, Leping Feng, and Romain Rumpler. "Design of broadband acoustic metamaterials for low-frequency noise insulation." The Journal of the Acoustical Society of America 141, no. 5 (2017): 3574-3574.

Thesis

10. **Liu, Z.**, "Design of soundproof panels via metamaterial concept." PhD diss., KTH Royal Institute of Technology, 2019.

PUBLISHED OPEN-SOURCE CODE

NAME **STransLAMP**
UPDATED May 18th, 2021, GITHUB.COM/ZIBO-KTH/STRANSLAMP
DESCRIPTION *Estimation of Sound Transmission Loss of Acoustic Metamaterial Panels*

NAME **SooMa**
UPDATED May 18th, 2021, GITHUB.COM/ZIBO-KTH/SOOMA
DESCRIPTION *Estimation of Sound Insertion Loss of a Multilayer Pipeline Jacket System*

CONFERENCE

07/2021 ICSV 27, virtually held by IIAV
Oral presentation: "*Design of curved sandwich panels to overcome the ring frequency and coincidence effects*"

06/2021 24th International Conference on Composite Structures, virtually held University of Porto, Portugal,
Oral presentation:"*Curved double wall with embedded resonators to improve the sound transmission loss*"

07/2018 ICSV 25, Hiroshima, Japan
Oral presentation: " *Investigation on the acoustic behaviour of the locally resonant metamaterial curved panel*"

06/2017 Acoustics'17, Boston, Massachusetts
Oral presentation: " *Design of broadband acoustic metamaterials for low-frequency noise insulation* "

06/2016 BNAM 2016, Stockholm, Sweden
Oral presentation: " *A finite element model for the vibro-acoustic analysis of plates and sandwich structures* "

CERTIFICATE

NAME **Machine Learning**
ISSUED ON May 18th, 2021
CERTIFICATE X87UF4TPTLHV, *an online non-credit course authorized by Stanford University and offered through Coursera*

AWARDS

2014 **CSC Scholarship**
China Scholarship Council

2011 **Excellent Graduate**
Beijing Institute of Technology

REFERENCES

Dr. Leping Feng (principal supervisor)

POSITION Associate Professor
EMPLOYER Department of Aeronautical and Vehicle Engineering
KTH Royal Institute of Technology
EMAIL fengl@kth.se

Dr. Romain Rumpler (co-supervisor)

POSITION Researcher
EMPLOYER Department of Aeronautical and Vehicle Engineering
KTH Royal Institute of Technology
EMAIL rumpler@kth.se

Dr. Qi Li

POSITION CEO
EMPLOYER Yi Duo Information Technology Co., Ltd.(Shanghai)
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Dr. Wuzhou Yu

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EMPLOYER Institute of Acoustics, Tongji University
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Dr. Dameng Liu

POSITION Associate Professor
EMPLOYER Department of Mechanical Engineering, Tsinghua University
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Dr. Bin Li

POSITION Professor, Dean of School of Materials, SYSU
EMPLOYER School of Materials, Sun Yat-sen University
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