Woen-Sug Choi

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PROFILE

- Highly self-motivated Ph.D. candidate with demonstrated research expertise analysis of flow-induced noise and vibration incorporating CFD calculations. Strong interpersonal skills and research project managements.
- Rich experience in modeling and simulating using OpenFOAM and in-house aeroacoustics, structure solver modules.
- Experience in multibeam sonar simulation plugin developments using GPU acceleration and dynamics/kinematics plugins for underwater gliders at ROS-Gazebo platform for autonomous robotics
- Strong adaptation to different programming languages. (First learned Visual Basic programming at age of 9)
- Language: Fluent in Korean (Native), English (Graduated middle school in San Antonio, Texas, USA), and Japanese.
- US residency experience : 9th grade at Rogers high school, Newport, RI (3 years grade skipping at age of 13)
- Member of a military family
  - Father : former submarine captain and naval attaché to USA retired as a rear admiral at Republic of Korea Navy.
  - Brother : Served Republic of Korea Marine Corps
  - Myself : Served as Technical Research Personnel for Republic of Korea Army

EDUCATION

July. 2020 ~ Present — **Naval Postgraduate School** (Postdoctoral Researcher) — Monterey, CA, USA
CRUSER (Consortium for Robotics and Unmanned Systems Education and Research)
NRC Research Associateship Award (Research Associate Program)
(Developments of virtual underwater acoustic environments and test and evaluation platforms for robotic autonomous systems, PI : Prof. Brian Bingham)

Mar. 2020 ~ June. 2020 — **Center for Naval Ship Engineering** (Postdoctoral Senior Researcher) — Seoul, Korea
Institute of Engineering Research, Seoul National University

Mar. 2013 ~ Feb. 2020 — **Seoul National University** (Integrated Ph.D. Program) — Seoul, Korea
Department of Naval Architecture and Ocean Engineering, Ship Noise and Vibration Laboratory
Thesis: Development of numerical analysis methods for flow-induced noise due to turbulent flows around underwater structures
Advisor: Prof. Suk-Yoon Hong

Mar. 2009 ~ Feb. 2013 — **Yokohama National University** (Korea-Japan Joint Government Scholarship Program) — Yokohama, Japan
Department of Mechanical Engineering and Materials Science, Digital Engineering Laboratory
Thesis: Constrained B-spline surface fitting by iterative geometric approximation algorithm
Advisor: Prof. Takashi Maekawa
Bachelor of Science in Mechanical Engineering and Materials Science (Machine processing course)

RESEARCH INTEREST

- **Computational aeroacoustics/hydroacoustics and vibroacoustics**
  - ✓ Modeling and simulation of flow-induced noise and vibration
  - ✓ Turbulence models of computational fluid dynamics and application of computational acoustics
- **Fluid-structure interaction analysis**
  - ✓ Predictions of vibration and noise excited by turbulent boundary layers and turbulent flows
  - ✓ Simulation of flow-induced resonance behavior such as frequency lock-in phenomenon and safety boundaries.
- **Automonous robotics simulations**
  - ✓ Kinematics and dynamics of underwater vehicles
  - ✓ Simulation multibeam sonar using GPU accelerations

AWARDS

- **NRC Research Associateship Award** – *Research Associateship Programs* July. 2020 ~ Present
  The National Research Council of the National Academies, USA
  'Developments of virtual underwater acoustic environments and test and evaluation platforms for robotic autonomous systems' at Naval Postgraduate School in Monterey, California, USA

RESEARCH EXPERIENCES

- **Researcher (PM)** – *Developments of virtual underwater acoustic environments and test and evaluation platforms for robotic autonomous systems* (Funded by NRC and NPS) July. 2020 ~ Present
  - ✓ Development of multibeam sonar for underwater applications using GPU accelerations to support real-time simulation of autonomous vehicles. Kinematics/dynamics plugins for underwater gliders in ROS-Gazebo platform. (https://github.com/Field-Robotics-Lab/DAVE)

- **Researcher (PM)** – *Developemnt of vibrational response prediction methods for underwater structures excited by wake considering fluid-structure interactions* Mar. 2019 ~ June. 2020
  (Funded by Hyundai Heavy Industries)
  - ✓ Development of prediction methods for vibrational response of self-excited lifting bodies with hybrid coupling FSI analysis to simulate frequency lock-in and effect of trailing edge designs to its characteristics.

- **Researcher (PM)** – *Future Submarine Low Noise Propeller Specialized Laboratory* Oct. 2018 ~ June. 2020
  (With Korea Research Institute of Ships & Ocean Engineering funded by Agency for Defense Development)
  - ✓ Broadband noise predictions of marine propellers induced by turbulent boundary layer using wall pressure spectrum models with available RANS CFD results.
  - ✓
- **Researcher (PM)** – *Research on engineering requirements of next generation advanced navy ships and acquisition considerations for core equipment* April. 2018 ~ Dec. 2018
  (With Daewoo Shipbuilding and Marine Engineering funded by Republic of Korea Navy)
  - ✓ Conceptual design calculation methods development and literature research for future advanced navy ship equipment requirements including acquisition consideration and planning.

- **Researcher (PM)** – *Research on technical counterplans for future propulsion systems* Aug. 2017 ~ Dec. 2017
  (Funded by Republic of Korea Navy)
  - ✓ Conceptual design calculation methods development and literature research for future propulsion systems including pump-jet propulsions and noise attenuations at sea.

- **Researcher** – *Development of performance assessment methods for perforated noise absorption structures in high flow environments* (Funded by Hyundai Electronics) Aug. 2017 ~ Dec. 2017
  - ✓ Estimation of noise produced by perforated structures in flow environments

- **Researcher (PM, Representative)** – *Advanced Naval Vessels Research Laboratory* June. 2013 ~ Dec. 2017
  (Funded by Agency for Defense Development and Daewoo Shipbuilding and Marine Engineering)
  - ✓ Turbulence-induced noise analysis of ship appendages using acoustic analogy and turbulent boundary layer excited vibro-acoustic response analysis for ship hull designs using empirical wall pressure spectrum models and Energy flow analysis methods.

- **Researcher** – *Underwater self-noise analysis modeling and measurements* June. 2014 ~ June. 2015
  (Funded by Agency for Defense Development)
  - ✓ Calculation of flow-induced noise generated at the head of torpedoes

PUBLICATIONS

1. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, J.-H Choi, S.-G. Lee, I.-R. Park, H.-S. Seol, and M.-J. Kim, "Time domain broadband noise predictions for non-cavitating marine propellers with wall pressure spectrum models", *International Journal of Naval Architecture and Ocean Engineering*, **13**, 75-85, (2021). **SCI**
2. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, J.-H, "Numerical simulation of lock-in phenomenon and using hybrid-coupling fluid-structure interaction analysis methods for rudder designs", *in preparation.*
3. **W. –S. Choi**, S. -Y. Hong, H.-W. Kwon, J.-W. Seo, S.-H. Rhee, and J.-H. Song, "Estimation of turbulent boundary layer induced noise using energy flow analysis for ship hull designs", *Journal of Engineering for the Maritime Environment*, **234**, 1, 196-208, (2020). **SCI**
4. **W. –S. Choi**, S. -J. Jeong, S.-Y. Hong, J.-H. Song, H.-W. Kwon, and M.-J. Kim, "Predictions of Broadband Noise for non-cavitation hydrofoils using wall pressure spectrum models", **25**, 6, 765-771, (2019). KCI, In Korean.
5. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, J.-W. Seo, and S.-H. Rhee, "Analysis of hull-induced flow noise characteristics for wave-piercing hull forms", *Journal of the Korean Society of Maritime Environment & Safety*, **24**, 5, 619-627, (2018). KCI, In Korean
6. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, "Prediction of turbulent boundary layer noise on plate using energy flow analysis", *Transactions of the Korean Society for Noise and Vibration Engineering*, **27**, 5, 608-615, (2017). KCI, In Korean
7. Y.-S. Choi, **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, H.-S. Seol, and C.-M. Jung, "Development of formulation Q1As method for quadrupole noise prediction around a submerged cylinder", *International Journal of Naval Architecture and Ocean Engineering*, **9**, 5, 484-491, (2017). **SCI**
8. **W. –S. Choi**, Y.-S. Choi, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and H.-S. Seol, "Experimental investigation of noise generated by submerged circular cylinder", *Noise Control Engineering Journal*, **65**, 4, 288-294, (2017). **SCI**
9. **W. –S. Choi**, Y.-S. Choi, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, "Turbulent-induced noise of a submerged cylinder using a permeable FW-H method", *International Journal of Naval Architecture and Ocean Engineering*, **8**, 3, 235-242, (2016). **SCI**
10. J.-Y. Kim, **W. –S. Choi**, S. -Y. Hong, H.-G. Chung, J.-H. Song, W.-S. Im, and H.-W. Kwon, "A Study on Efficient Test & Evaluation Methods in Naval Ship Acquisitions", *Journal of the Korea Institute of Military Science and Technology*, **19**, 6, 703-711, (2016). KCI, In Korean
11. Y.-S. Choi, S. -Y. Hong, J.-H. Song, H.-W. Kwon, **W. –S. Choi**, and C.-M. Jung, "Turbulent-induced noise of 2-dimensional sonar dome shaped structure", *Transactions of the Korean Society for Noise and Vibration Engineering*, **26**, 1, 39-48, (2016). KCI, In Korean
12. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, "Turbulent-induced noise around a circular cylinder using permeable FW-H methods", *Journal of the Korean Society of Marine Environment & Safety*, **20**, 6, 752-759, (2014). KCI, In Korean

INTERNATIONAL CONFERENCES (FIRST AUTHOR LIST ONLY)

1. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, and H.-W. Kwon, "Turbulent boundary layer noise analysis using energy flow analysis", NOVEM2018, Ibiza, Spain, (2018) – oral.
2. **W. –S. Choi**, S. -Y. Hong, T.-G. Kim, Y. Choi, J.-H. Song, and H.-W Kwon, "Turbulent-induced noise of underwater submerged bodies for hydrodynamic design", IMDC2015, Tokyo, Japan, (2015) – oral.
3. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, "Turbulent-induced noise around a circular cylinder using permeable FW-H methods", NAA2015, Shanghai, China, (2015) – oral.

DOMESTIC CONFERENCES (FIRST AUTHOR LIST ONLY)

1. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, J.-H Choi, S.-G. Lee, I.-R. Park, H.-S. Seol, and M.-J. Kim, "Predictions of non-cavitation broadband noise for underwater propellers", KSNVE2019, Jeju, Korea (2019) – oral.
2. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, M.-J. Kim, and K.-C. Lee, "Numerical study on non-cavitation broadband noise for hydrofoil", KIMST2018, Daejeon, Korea (2018) – oral.
3. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, "Turbulent-induced noise prediction methods for high-speed future naval ships", KIMST2017, Daejeon, Korea (2017) – oral.

4. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, "A study on characteristics of turbulent boundary layer noise using fluid-structure interaction analysis", KSNVE2017, Kwangju, Korea (2017) – oral.
5. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, "Characteristics of turbulent-induced noise for naval ship appendages", KSOE2014, Busan, Korea (2014) – oral.
6. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and Y.-L. Jung, "Turbulent-induced noise for underwater submerged bodies", KSOE2014, Busan, Korea (2014) – oral.

MAJOR COURSES

- Engineering Acoustics
- Ship Noise and Vibration Measurements and Analysis
- Fundamentals of Underwater Acoustics
- Noise Control Engineering
- Turbulent Flows
- Advanced Computational Fluid Dynamics (Discretizations of Compressible Euler and Navier-Stokes Eqn.)
- Advanced Computational Fluid Dynamics (Basic Elements and Scalar Conservation Laws)
- Numerical Analysis in Mechanical Engineering
- Computational Fluid Dynamics for Turbulent Ship Flows