

SIMULATION-BASED DESIGN OPTIMIZATION IN MARINE ENGINEERING

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ABSTRACT

The field of marine engineering is at a pivotal juncture, with sustainability, efficiency, and innovation at the forefront of global priorities. The drive towards optimizing marine systems, including vessels, offshore structures, and energy devices, has never been more pressing. In this context, Simulation-Based Design Optimization (SBDO) has emerged as a transformative approach, combining computational simulations with optimization techniques to pioneer advancements in marine engineering.

Despite remarkable progress, the journey of SBDO towards realizing its full potential is fraught with complexities. A recent literature review on SBDO [1] reveals a landscape where the integration of multidisciplinary methods, handling of high-dimensional design spaces, and the efficient use of computational resources remain significant hurdles. Furthermore, the adoption of advanced optimization and uncertainty quantification algorithms within SBDO processes uncovers a need for a more nuanced understanding of SBDO applications in order to navigate the intricate marine environment.

This invited session seeks to unravel the current state, unearth the challenges, and explore the horizon of opportunities that SBDO presents for marine engineering. It aims to bring together academia, industry, and research entities to forge discussions on the advancements in SBDO methodologies, address the gap between theory and practice, and showcase innovative applications in marine engineering.

Topics of Interest:

- Emerging trends in SBDO for marine engineering,
- Advanced optimization algorithms for marine applications,
- Multidisciplinary and multi-objective optimization,
- Surrogate modeling and machine learning in SBDO,
- Handling uncertainty and environmental variability in marine engineering optimization,
- Design space exploration, generative AI, and dimensionality reduction,

- Case studies and practical applications of SBDO in marine systems design.

We invite researchers and practitioners to submit original research, case studies, and reviews that contribute to the body of knowledge on SBDO in marine engineering.

This session is envisioned as a platform to critically assess the progress, tackle the existing challenges, and chart a forward-looking course for SBDO in marine engineering. Together, we aim to foster a collaborative ecosystem that propels the field towards achieving groundbreaking efficiency, sustainability, and innovation in marine systems design.

REFERENCES

- [1] Serani, A., Scholcz, T. P., Vanzi, V., *A Scoping Review on Simulation-based Design Optimization in Marine Engineering: Trends, Best Practices, and Gaps*, Archives of Computational Methods in Engineering, 2024, in press.