Where Are We and Where Are We Going? Analyzing Simulation-Driven Design Optimization Trends in Marine Engineering by Scoping Review

T.P. Scholcz[1*] and A. Serani[2]

[1]Maritime Research Institute Netherlands (MARIN), Wageningen, The Netherlands
e-mail: t.p.scholcz@marin.nl

[2]National Research Council-Institute of Marine Engineering (CNR-INM), Rome, Italy
e-mail: andrea.serani@cnr.it

ABSTRACT

In the marine/ocean engineering context, the demand for increasingly efficient products (e.g., hull-form, appendages, propellers, and offshore energy harvesting devices) is constantly increasing. These products must respond to an ever-increasing number of specific and complex requirements in order to improve on safety, sustainability, and a healthier environment. Over the last thirty years, engineering design, especially in the marine context, has radically transformed thanks to the exponential development of IT and digital resources. This stimulated the development of efficient simulation-driven design optimization (SDDO) methods, integrating CFD and design modification methods with optimization algorithms. There is an extensive body of literature describing state of the art SDDO approaches and research developments. In practice, the large scope makes it difficult to search and navigate the literature. Due to the complex and heterogeneous nature of the research, a scoping review helps to provide a map between the existing literature and characteristics of SDDO methods, see [1, 2]. This work answers the following questions:

- What are the current best practices in using SDDO methods for marine engineering?
- What issues arise when applying SDDO methods to marine engineering problems?
- What are the main research gaps and possible future directions?

For this purpose, the following steps are undertaken:

1. Search and selection: paper identification, title/abstract screening and eligibility.
2. Full text reading and characterization.
3. Summary and synthesis.

The scoping review may be used as a starting point for a systematic review in the future. This makes the review attractive, as it provides insight in the literature as well as a good basis for further study.

REFERENCES

[1] Serani, A, Scholcz, TP, 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).

[2] Pham MT, Rajić A, Greig JD, Sargeant JM, Papadopoulos A, McEwen SA. A scoping review of scoping reviews: advancing the approach and enhancing the consistency. Res Synth Methods. 2014 Dec;5(4):371-85.