

SIMULATION-DRIVEN DESIGN OPTIMIZATION IN MARINE ENGINEERING

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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 transformation from traditional design, built, and test approaches, to more efficient and effective simulation-driven design optimization (SDDO) processes, by integrating numerical solvers (e.g., CFD and CSD) and design modification methods with optimization algorithms and also uncertainty quantification methods [1, 2]. Nevertheless, despite the advancement of computational resources, the results obtained through the SDDO process are still often a compromise between its efficiency (speed in achieving the optimum, given a computational budget) and effectiveness (accurate simulations, requiring high-fidelity/computationally expensive solvers). Nowadays, the challenge of SDDO is to improve the overall optimization architecture, as well as its single components, in order to efficiently achieve accurate optimal solutions in solving complex engineering design problems, with prescribed (often limited) computational budget.

The aim of the invited session is to discuss the open issue of SDDO for marine/ocean engineering applications and present advanced methodologies to tackle these challenges. Topics of interest include, but are not limited to: optimization algorithms; multidisciplinary optimization architectures; surrogate modelling, machine learning, and multi-fidelity methods; design space assessment and dimensionality reduction; optimization under uncertainty.

REFERENCES

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- [2] Scholcz, T.P., *Data driven uncertainty quantification for computational fluid dynamics based ship design*, Proceedings of the VIII International Conference on Computational Methods in Marine Engineering MARINE 2019, 13-15 May 2019, Göteborg, Sweden.