ROBUST OPTIMIZATION OF HULL FORMS OPERATING IN REALISTIC OCEAN ENVIRONMENT- AN OVERVIEW

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ABSTRACT

Hydrodynamic performance of marine vehicles can be evaluated quite reliably for practical purposes nowadays. Furthermore, the evolution of computer resources allowed the incorporation of hull form optimization in the preliminary design stage of a vessel, where the hull form is actually established, while, afterwards, only minor and local modifications are carried out. Notably, since hull form optimization strongly depends on the marine environment and the operational profile of the vessel (sea-state, heading, speed, etc.), the efficient quantification of their effect is crucial for the outcome. Real ocean environment is by nature a stochastic process. Incorporation of the stochastic characteristics of the marine environment in conjunction with the probability distribution of the operational profile of the vessel (speed, heading) leads directly to a repetitive implementation of the optimization scheme for numerous times in order to satisfy the Monte-Carlo technique and the Central Limit Theorem. A more efficient procedure, requiring limited resources in computer power, is proposed in this paper, which accounts for the most critical sea conditions only, to optimize the added resistance of the designed ship in waves.

KEYWORDS

Ship design; Simulation-based design optimization; Deterministic Optimization; Stochastic Optimization; Resistance; Added resistance; Operability; Potential flow; RANSE.