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Automated scantling optimization of ships' midship transverse frame in concept design phase

Case study on optimizing structural design of vessels

This paper concerns the scantling optimization of a vessel's midship transverse frame during the conceptual design phase. The main focus of the present research is to demonstrate an automated optimization process for a typical midship transverse frame of RoPax vessel which has been developed within the framework of EU HOLISHIP project (2016-2020). To this end, a number of existing tools along with their new script/batch-mode developments (namely STEEL®, a tool from Bureau Veritas for the structural strength assessment of primary transverse frames, and modeFRONTIER® as the optimization tool) as well as some new in-house tools/modules (e.g. Rule Infringement Indicator, Weight/CG Calculator) have been integrated under an automated iterative routine.

Shipbuilding and the shipping sector face increasing pressure to balance the conflicting needs and requirements of improving safety, reducing environmental impact, increasing flexibility for varying operational conditions, improving life cycle cost/performance, etc, within the context of a highly competitive market.

Meeting such significant challenges requires the use of a holistic, multi-disciplinary and multi-objective design optimization platform from the earliest design stages in the traditional ship design process. The creation of such a platform was to some extent addressed during some former research-based EU-funded projects such as IMPROVE (2006-2009) (for examples see the papers published by Rigo et al. (2010) and Klanac et al. (2011)),

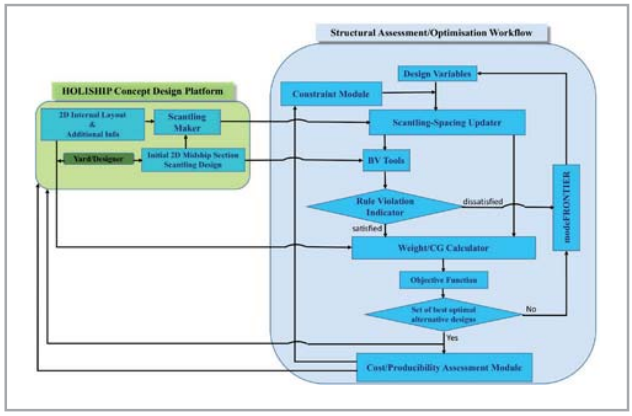

Fig. 1. Integrated automated structural ship design assessment/optimization workflow for conceptual design purposes (Bayatfar et al. 2018; extended version).