CONTENT
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An optimisation model is proposed for the Ship Design and Deployment Problem (SDDP). This model can be used to support the development of the contract specification for non-cargo, service type of ships, facing a set of available contracts or market opportunities with different start-up periods, durations and vessel capability requirements. The proposed model is a binary integer programming (BIP) model, where the problem is to optimally select a design while at the same time considering which future contracts the vessel should be deployed in. Computational study shows that the model is able to solve the SDDP even for large problem sizes. Variants and extensions to the SDDP model are suggested including concurrent selection of multiple vessels (Fleet Design and Deployment Problem), existing initial fleet and forced contract assignment for some of the vessels. Further, generation of contracts and market opportunities for alternative future scenarios can also be considered.

A comparison is made between different formats for presenting the results from ship's hull structure reliability calculations. These include the formats produced by FORM (First Order Reliability Method) and SORM (Second Order Reliability Method), scientific format of the probability of exceedance, reliability as a number between zero and unity and reliability expressed in Bells. After the analysis of the advantages and drawbacks of these methods, the measurement of the ship hull structure reliability in Bells is recommended. This measure is simple in application because it avoids the transformation of PDFs required by FORM or SORM and provides a more convenient presentation of the potential change of structural reliability due to design changes. In addition, direct link between the probability of failure (presented in scientificnclu format) and the reliability presented in Bells allows for easy expression in Bells of the results measured in any other system.

There is a limit to how far an application program can evolve in incremental steps. At some point in time, progression requires radical changes: a new generation that parts with the limitations of its legacy. In our case, due to richness in features, a complete rewrite of our hull design software would lead to an unattractively long down-time, which is why we have pursued a more efficient allocation of our programming resources. This is the report of an approach in which we keep both the production version and the development version fully functional within the same executable, providing a non-disruptive transition from one application generation to the next, while building on proven foundations.

In this paper, the metamodelling approach is applied to the multidisciplinary design optimisation of a ship hull with regard to resistance, seakeeping and maneuvering performance. The hull shape is described by a set of design variables used in the simulations. At the top system level, a simple cost metric is defined to drive the overall design optimisation process. Changes to the hull shape are reflected in the numerical model for resistance computations and in the seakeeping and maneuvering assessment. An automated process has been developed for propagating changes to the hull form in the numerical model used for the resistance computations; this expedites the computations at the sample points used for developing the metamodels. The validity of employing metamodels instead of the actual analysis methods during the optimisation is demonstrated by comparing the values of the objective functions and constraints at the optimum point when using the actual analysis methods and the metamodels. The effectiveness of the multidisciplinary design optimisation algorithm is demonstrated using a simple analytical example.