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Meta-modeling Effects on Multi-objective Design Optimization of Apparatus for Offshore Installation Barge

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Extended Abstract

Offshore installation barge, one of the special offshore support units for installation of ships and offshore structures, should maintain the stability of the barge using mechanical device such as lifting system, holding clamp, spud, etc. The holding clamp for the offshore installation barge is the important device to maintain the stability as well as to mount and/or to move the spud during the installation work.

Recently, various studies have been carried out to optimize the design of the mechanical devices for the offshore structures [1~2].

In this study, we performed a comparative study on the approximate multi-objective design optimization to realize the structural design to improve the weight and vibration performances of the holding clamp, which is the mechanical device for the offshore installation barge, considering the various load conditions and vibration characteristics. In the approximate multi-objective optimization process, regression meta-model was generated using response surfaces method (RSM) while Kriging and back-propagation neural network (BPN) methods were applied to interpolation meta-modeling. The Pareto solutions, multi-objective optimal solutions, were derived using the non-dominated sorting genetic algorithm (NSGA-II) [3]. In terms of the structure design of the holding clamp considered in this study, characteristics and influence of the meta-modeling on the multi-objective optimization were reviewed through the comparison of the approximate optimization results with the meta-models and the actual optimization.

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