

Study on Optimization Design of Pressure Hull for Underwater Vehicle

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Abstract : In order to improve the efficiency and accuracy of the pressure hull structure, optimization of underwater vehicle based on response surface methodology, a method for optimizing the design of pressure hull structure was studied. To determine the pressure shell of five dimensions as a design variable, the application of thin shell theory and the Chinese Classification Society (CCS) specification was carried on the preliminary design. In order to optimize variables of the feasible region, different methods were studied and implemented such as Opt LHD method (to determine the design test sample points in the feasible domain space), parametric ABAQUS solution for each sample point response, and the two-order polynomial response for the surface model of the limit load of structures. Based on the ultimate load of the structure and the quality of the shell, the two-generation genetic algorithm was used to solve the response surface, and the Pareto optimal solution set was obtained. The final optimization result was 41.68% higher than that of the initial design, and the shell quality was reduced by about 27.26%. The parametric method can ensure the accuracy of the test and improve the efficiency of optimization.

Keywords : parameterization, response surface, structure optimization, pressure hull

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