An Adaptive Hybrid Surrogate-Assisted Particle Swarm Optimization Algorithm for Expensive Structural Optimization

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Abstract : Choosing an appropriate surrogate model plays an important role in surrogates-assisted evolutionary algorithms (SAEAs) since there are many types and different kernel functions in the surrogate model. In this paper, an adaptive selection of the best suitable surrogate model method is proposed to solve different kinds of expensive optimization problems. Firstly, according to the prediction residual error sum of square (PRESS) and different model selection strategies, the excellent individual surrogate models are integrated into multiple ensemble models in each generation. Then, based on the minimum root of mean square error (RMSE), the best suitable surrogate model is selected dynamically. Secondly, two methods with dynamic number of models and selection strategies are designed, which are used to show the influence of the number of individual models and selection strategy. Finally, some compared studies are made to deal with several commonly used benchmark problems, as well as a rotor system optimization problem. The results demonstrate the accuracy and robustness of the proposed method.