

Damage Identification of Complex Structures Using a Surrogate-Assisted Model

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Abstract. Structural Damage Identification (SDI) plays a crucial role in structural health monitoring [1]. In this abstract, we present a novel damage identification method. Initially, a Stochastic Spectrum Embedding (SSE) model, which possesses superior small-sample modeling capabilities, is utilized to replace the computationally expensive structural finite element model at a low cost. Subsequently, by leveraging the characteristics of an Enhanced Termite Life Cycle Optimizer (ETLCO), a novel asymmetric probability-based movement function is autonomously designed to enhance its performance [2,3]. Using a small-scale laboratory dam with measured vibration response as an example, the effectiveness and efficiency of the proposed method in addressing SDI problems were investigated [4], yielding two important findings: (1) The newly developed movement function greatly enhances the ability of the ETLCO to escape local optima when dealing with high-dimensional, multi-modal problems and (2) The ETLCO-SSE method achieves a qualitative leap in computational efficiency for solving SDI problems, while exhibits high accuracy and robustness. The proposed method has the potential to serve as a valuable tool for damage identification in large and complex structures.

References

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