Fuzzy Surrogates in Fitness Function Approximation for Evolutionary Structure Design

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Abstract:
Evolutionary design of large-scale structures has been the topic of much recent research; however, such designs are usually hampered by the time consuming stage of prototype evaluations using standard finite element analysis (FEA). In this paper, a novel granulation based fitness approximation scheme is proposed in order to approximate the fitness function for substituting the time consuming large-scale problem analysis (L-SPA) by FEA. The proposed method is applied to two different hardware design problems that are evaluated using finite element analysis i.e. 3-layer composite beam and Airplane wing. In comparison with standard application of evolutionary algorithms, statistical analysis confirms that the proposed approach demonstrates an ability to reduce the computational complexity of the design problem without sacrificing performance..

Key words:
Evolutionary algorithms, Computational complexity, Fuzzy Surrogates, Fitness Granulation (FG).

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