DEVELOPMENT OF AN OPTIMIZATION MODULE USING PARTICLE SWARM ALGORITHM VIA LOCALIZATION

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ABSTRACT

Particle swarm optimization is one of way to optimize the problem which has complexity and discontinuous search space. It has more efficiency and fast convergence speed rather than gradient based methods such as gradient descent and quasi-newton methods. But it suffers from premature convergence and early local minima. Another drawback is performance deterioration when the dimensionality of the search space increases [1]. Recently, various researches on PSO development are performed. There are several categories for development strategies; Parameter selection for standard PSO, Topology of the particle swarm and Hybrid version of the particle swarm [2,3,4].

In this paper, we proposed the strategy for decreasing the dimensionality of search space using local optimization. We developed the optimization module for PSO and separated the global optimization and local optimization. In optimization with FEM analysis, PSO is effective way because of its complexity and discontinuous. To decrease the search space, FEM model was partitioned by splitting the elements; it is called local model. The global design variables which are not included in local model are remained and are optimized by global optimization. The standard of splitting is depends on user's experience and intuition for rapid design optimization. Local optimization is constructed for PSO algorithm. Linear stress analysis, thermal stress analysis, vibration analysis, failure analysis and buckling analysis are performed and its results are used for objective function and constraint. In order to validate result from the optimization module, stiffened plate model are optimized and it compared with standard PSO.

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