PARTICLE SWARM OPTIMIZATION (PSO): AN ALTERNATIVE METHOD FOR COMPOSITE OPTIMIZATION

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ABSTRACT

The goal of this document is to present the background, improvements and variants of the algorithm particle swarm optimization (PSO) based on the movement of a bird flock, as an alternative method of optimization for composite materials. The strong point of this algorithm is its simplicity and adaptability to all kind of problems and fields.

The first part of the article is a compilation of different papers that deal with problems found while applying PSO and the solutions obtained. The article discusses the way to deal with large design spaces and the convergence problem, the discrete variables, local vs. global minima and how to escape from local minima with the stretching function. Finally, the constrained problem is solved using an optimization penalty method called Augmented Lagrangian function method. It is chosen, as general idea, which is the best option to develop successfully a PSO suitable for each kind of problem.

In the second part of the article, the PSO algorithm is compared to the classical genetic algorithms used for optimization in the software BOSS Quattro. Other kind of problems that can appear are the constrained ones. To solve them, a study of the Augmented Lagrange Multiplier Method is considered, where the PSO is used to optimize the augmented Lagrangian function giving satisfactory results for common problems.

As future prospects, the study of different ways to improve the algorithm is considered. For example, the way to update the particles is been studied, choosing the updating of the worse particle, the best particle or a percentage of the best/ worst population, giving the best results the updating of the worst ones. Future studies could include the way the particles are chosen. As last results, industrial applications will be tested in different software.

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