A Breeder Algorithm for Stellarator Optimization*

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In this work, we present initial work towards the development of a breeder optimization algorithm (BA). The BA algorithm combines a global genetic algorithm (GA) with a local Levenberg-Marquardt optimizer (LM) used to refine each generation. The goal of the BA algorithm is to take advantage of the global parameter space search of the evolutionary algorithm while maintaining the efficiency of the LM method. In principle, the primary advantage of evolutionary algorithms such as GA is that they perform a global parameter space search while the steepest descent methods (such as LM) perform a local parameter space search for the optimal configuration. Previously, we presented results which indicated the evolutionary algorithms are more sensitive to the user input than the LM method and that they are also constrained in stellarator optimization by the fact that equilibria do not exist for a large range of parameter space. Here, we present a description of the breeder algorithm and the first results from the application of the breeder algorithm to stellarator optimization.