

An Overview of the Adaptive Pattern Search Algorithm and its Application to Engineering Optimization Problems

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Abstract

We describe adaptive pattern search (APS), a new variant of simple pattern search (SPS) methods. The adaptive component of APS stems from the use of variable expansion and contraction factors on the core pattern, as opposed to fixed values of these factors as are typically used in SPS. The APS algorithm preserves the stationary point convergence properties of SPS, while the expected asymptotic rate of convergence for APS is half that of SPS. The adaptive expansion and contraction factors used in APS permit the maximal use of previous function evaluations. Thus, APS is well-suited for use on engineering optimization problems, where typically each function evaluation is very expensive and where function gradients may not exist. We will describe computational experiments with simple test problems and several engineering optimization problems that illustrate the utility of this new class of direct search methods.

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