

SNBOFIT – Stable Noisy Optimization by Branch and Fit

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The software package SNBOFIT for bound constrained (and soft constrained) noisy optimization of an expensive objective function is described. It combines global and local search by branching and local fits. The program is made robust and flexible for practical use by allowing for hidden constraints, batch function evaluations, change of search regions, etc.

Categories and Subject Descriptors: G.1.6 [**Optimization**]: Global optimization; Constrained optimization

General Terms: Algorithms

Additional Key Words and Phrases: branch and bound, derivative-free, surrogate model, parallel evaluation, hidden constraints, expensive function values, noisy function values, soft constraints

1. INTRODUCTION

SNBOFIT (*stable noisy optimization by branch and fit*) is a MATLAB package designed for selecting continuous parameter settings for simulations or experiments, performed with the goal of optimizing some user-specified criterion. Specifically, we consider the optimization problem

$$\begin{aligned} \min f(x) \\ \text{s.t. } x \in [u, v], \end{aligned}$$

where we use interval notation for *boxes*

$$[u, v] := \{x \in \mathbb{R}^n \mid u_i \leq x_i \leq v_i, i = 1, \dots, n\},$$

with $u, v \in \mathbb{R}^n$ and $u_i < v_i$ for $i = 1, \dots, n$, i.e., $[u, v]$ is bounded with nonempty interior. A box $[u', v']$ with $[u', v'] \subseteq [u, v]$ is called a *subbox* of $[u, v]$. Moreover, we assume that f is a function $f : D \rightarrow \mathbb{R}$, where D is a subset of \mathbb{R}^n containing $[u, v]$. We will call the process of obtaining an approximate function value $f(x)$ an *evaluation* at the point x (typically by simulation or measurement).

While there are many software packages that can handle such problems, they usually cannot cope well with one or more of the following difficulties arising in practice:

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