Mathematics > Optimization and Control

Univariate global optimization with multiextremal non-differentiable constraints without penalty functions

Yaroslav D. Sergeyev

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This paper proposes a new algorithm for solving constrained global optimization problems where both the objective function and constraints are one-dimensional non-differentiable multiextremal Lipschitz functions. Multiextremal constraints can lead to complex feasible regions being collections of isolated points and intervals having positive lengths. The case is considered where the order the constraints are evaluated is fixed by the nature of the problem and a constraint i is defined only over the set where the constraint $i-1$ is satisfied. The objective function is defined only over the set where all the constraints are satisfied. In contrast to traditional approaches, the new algorithm does not use any additional parameter or variable. All the constraints are not evaluated during every iteration of the algorithm providing a significant acceleration of the search. The new algorithm either finds lower and upper bounds for the global optimum or establishes that the problem is infeasible. Convergence properties and numerical experiments showing a nice performance of the new method in comparison with the penalty approach are given.

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