A Direct Heuristic Local Search Method - Numerical Results and an Application

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Local search methods are widely used for solving nonlinear optimization problems. Most of the implementations of these algorithms exploit the knowledge of more information than simply the values of the objective function in some points, i.e., they need calculations for the gradient or even higher derivatives, and demand sometimes sophisticated programming work. A very simple idea to make local search easier is to sample a starting point in the domain of the objective function - as many other local methods do - and try to step further in a coordinate direction where the function decreases. In contrast to other algorithms this idea does not need any derivatives and is very easy to implement. The basic performance is similar to that of the simplex method for linear search: finite possibilities of steps are considered and the best one is chosen. The principle of coordinatewise search itself is not new, it is nearly half a century old [2]. The basic idea is more general and is known as pattern search. Coordinatewise search can be considered as a special case of this wide family of methods, however, a very robust one which converges for most of the differentiable functions [3]. In the present work a small overview of pattern search methods is given. It is shown under what circumstances this special case, i.e., the coordinatewise direct search algorithm converges and some numerical tests are presented to demonstrate the behavior of this method and its superiority to the well-known gradient method on standard test functions.

Furthermore, we give an application of the proposed methods, on a set of test functions given in [1].

References

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