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MinFinder v2.0: An improved version of MinFinder ☆

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ABSTRACT

A new version of the "MinFinder" program is presented that offers an augmented linking procedure for Fortran-77 subprograms, two additional stopping rules and a new start-point rejection mechanism that saves a significant portion of gradient and function evaluations. The method is applied on a set of standard test functions and the results are reported.

New version program summary

Program title: MinFinder v2.0
Catalogue identifier: ADWU_v2_0
Program summary URL: http://cpc.cs.qub.ac.uk/summaries/ADWU_v2_0.html
Program obtainable from: CPC Program Library, Queen's University, Belfast, N. Ireland
Licensing provisions: Standard CPC Licence, http://cpc.cs.qub.ac.uk/licence/licence.html
No. of lines in distributed program, including test data, etc.: 14 150
No. of bytes in distributed program, including test data, etc.: 218 144
Distribution format: tar.gz
Programming language used: GNU C++, GNU FORTRAN, GNU C
Computer: The program is designed to be portable in all systems running the GNU C++ compiler
Operating system: Linux, Solaris, FreeBSD
RAM: 200 000 bytes
Classification: 4.9
Catalogue identifier of previous version: ADWU_v1_0
Journal reference of previous version: Computer Physics Communications 174 (2006) 166–179
Does the new version supersede the previous version?: Yes
Nature of problem: A multitude of problems in science and engineering are often reduced to minimizing a function of many variables. There are instances that a local optimum does not correspond to the desired physical solution and hence the search for a better solution is required. Local optimization techniques can be trapped in any local minimum. Global optimization is then the appropriate tool. For example, solving a non-linear system of equations via optimization, one may encounter many local minima that do not correspond to solutions, i.e. they are far from zero.
Solution method: Using a uniform pdf, points are sampled from a rectangular domain. A clustering technique, based on a typical distance and a gradient criterion, is used to decide from which points a local search should be started. Further searching is terminated when all the local minima inside the search domain are thought to be found. This is accomplished via three stopping rules: the "double-box" stopping rule, the "observables" stopping rule and the "expected minimizers" stopping rule.
Reasons for the new version: The link procedure for source code in Fortran 77 is enhanced, two additional stopping rules are implemented and a new criterion for accepting-start points, that economizes on function and gradient calls, is introduced.
Summary of revisions:

1. Addition of command line parameters to the utility program *make_program*.
2. Augmentation of the link process for Fortran 77 subprograms, by linking the final executable with the `g2c` library.
3. Addition of two probabilistic stopping rules.
4. Introduction of a rejection mechanism to the **Checking step** of the original method, that reduces the number of gradient evaluations.

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Additional comments: A technical report describing the revisions, experiments and test runs is packaged with the source code.
Running time: Depending on the objective function.

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☆ This paper and its associated computer program are available via the Computer Physics Communications homepage on ScienceDirect (http://www.sciencedirect.com/science/journal/00104655).

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