Griewank, Andreas; **Utke, Jean**; **Walther, Andrea**

Evaluating higher derivative tensors by forward propagation of univariate Taylor series.
(English) Zbl 0952.65028
Math. Comput. 69, No. 231, 1117-1130 (2000).

The paper describes a new approach to compute higher order derivatives of a function of several variables. The approach is based on the calculation of one-dimensional Taylor developments of the function along conveniently selected directions, i.e. directional Taylor developments. The directions are given by the lattice points of nonnegative integers whose coordinates add up to a fixed derivative order. It is shown that those developments allow to interpolate all the partial derivatives whose degrees are smaller or equal than the order considered initially.

The paper includes a discussion and estimates of the computational complexities, such as data structures and memory access pattern, as well as some time run results, which show that the proposed approach can be useful in applications that require the calculation of higher order derivatives in several variables.

Reviewer: Juan Pedro Milaszewicz (Buenos Aires)

MSC:

65D25 Numerical differentiation
65F30 Other matrix algorithms (MSC2010)
68W30 Symbolic computation and algebraic computation
65Y20 Complexity and performance of numerical algorithms
65T99 Numerical methods in Fourier analysis

Keywords:

higher order derivatives; computational differentiation; tensors; function of several variables; partial derivatives; computational complexities

Software:

ADOL-C

Full Text: DOI

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