Kavian, Masoud; McLenaghan, R. G.; Geddes, K. O.
Maple/Tensor: progress report on a new system for performing indicial and component tensor calculations using symbolic computation. (English) \[Zbl 0923.53002\]

In Chapter 1, the authors describe recent progress in the development of the new algebraic computing package MapleTensor (MT) for performing indicial and component tensor calculations. MT currently exceeds 20 000 lines of code written mainly in the C++ programming language [see T. A. Budd, ‘Classic data structures in C++’ (Addison-Wesley, Amsterdam) (1994; Zbl 0849.68016); B. Stroustrup, ‘The C++ programming language’ (repr.) (Addison-Wesley Publishing Company, Massachusetts) (1986; Zbl 0609.68011)], uses facilities of the computer algebra system (CAS) MAPLE, and can be easily adapted to other CAS, e.g., MATHEMATICA. Some of the capabilities of MT are similar to existing tensor packages, ITENSOR in MACSYMA, STENSOR in SHEEP, MATHTensor and RICCI in MATHEMATICA.

In Chapter 2, the authors discuss an object oriented design strategy for tensors. Then in Chapters 3-8 they give some examples in MT: basic tensorial operations (string processor, covariant differentiation, contraction with the metric tensor, (anti)symmetrization, the component evolution, etc.), a compiler for component calculation of tensorial quantities, definitions of tensors, simplification of algebraic expressions, definitions of tensors in moving frames, implementation of geometries with torsion.


For the entire collection see [Zbl 0903.00081].

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MSC:
53-04 Software, source code, etc. for problems pertaining to differential geometry
68W30 Symbolic computation and algebraic computation
53A45 Differential geometric aspects in vector and tensor analysis
83-04 Software, source code, etc. for problems pertaining to relativity and gravitational theory
83C22 Einstein-Maxwell equations
83F05 Relativistic cosmology
58A10 Differential forms in global analysis

Keywords:
tensor; Riemannian curvature; symbolic computation; MAPLE; object oriented design

Software:
SHEEP; NP; Mathematica; MACSYMA; Maple; MapleTensor; ITENSOR