EinS: a *Mathematica* Package for Tensorial Calculations in Astronomical Applications of Relativistic Gravity Theories

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The package called EinS has been implemented within *Mathematica* 2.2 enabling one to perform automatically complicated tensorial calculations typical for astronomical applications of relativistic gravitational theories. The principal features of the package are:

- Automatic handling of Einstein summations.

- User controllable splitting 4-indices into time (zero-valued)indices and space (non zero-valued) indices.

- Originally developed algorithm for simplification of tensorial expressions is implemented accounting for the user-defined symmetries of tensors and the possibility to rename dummy indices. The algorithm is consisting in (1) reducing each term into a simple "canonical" form (although equal terms may still have different forms after this operation, this decreases substantially the number of terms) and (2) subsequent pattern matching among the rest of terms. We also remove terms which are equal to zero as a contraction of symmetric and antisymmetric factors. This approach is proved to be more efficient than the algorithms based on reducing each term in a lexicographically minimal canonical forms used in some other packages.

- Standard build-in objects (the Kronecker's symbol, the Levi-Civita fully antisymmetric pseudotensor, a set of subroutines for computing standard quantities in the general theory of relativity).

- Printing tensorial expressions in "pretty" form and exporting them into the TeX or LaTeX forms including flexible, user-controllable alignment commands.

An example of application of the package for calculation of the Landau-Lifschits pseudotensor of the energy-momentum of gravitational field in a rotating reference system ($g_{0i} = O(c^{-1})$) in the first post-Newtonian approximation is described, the resulting expressions consisting of a few thousand terms. Physical motivation for the calculation is also briefly discussed.

The package is compared to the existing packages for tensorial calculations within *Mathematica* (Ricci, MathTensor, etc.). Since it is our intention to develop in the future an analogous package for Maple, we also confront our package with the recently developed Maple package GRTensor II.