Presentation in IMACS '97, Maui, Hawaii

Conference on Applications of Computer Algebra

Session: Algorithmic Analysis of PDEs

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Symbolic Computation of Conserved Densities for Nonlinear Evolution and Differential-Difference Equations

A straightforward method for the computation of polynomial-type conserved densities for systems of nonlinear evolution equations and its extension towards differential-difference equations will be presented. The technique is based on the scaling symmetries of the equations, and is completely algorithmic. The method can be implemented in any computer algebra system.
Our programs in *Mathematica* allow one to automatically compute conserved densities. Applied to systems with parameters, they can be used to determine the conditions on these parameters so that a sequence of conservation laws will exist, hence predicting integrability.

Software Demonstration:

CONDENS.M: Symbolic Computation of Conservation Laws for Systems of Nonlinear Evolution Equations with *Mathematica*

DIFFDENS.M: Symbolic Computation of Conservation Laws for Systems of Nonlinear Differential-Difference Equations with *Mathematica*

The programs *condens.m* and *diffdens.m* will be demonstrated with several examples, including equations with parameters, for which the compatibility conditions for the existence of conserved densities will be computed.