



Mathematisches
Forschungsinstitut
Oberwolfach



Oberwolfach Seminar

Structure-preserving methods for nonlinear hyperbolic problems

Organizers: Alina Chertok, Raleigh
Philippe G. LeFloch, Paris
Giovanni Russo, Catania
Date (ID): 24 – 30 November 2019 (1948a)
Deadline: 15 September 2019

Many problems in the physical sciences are modeled by nonlinear hyperbolic systems of partial differential equations. Often, such systems and their solutions enjoy certain structural properties that are of key importance in applications: conservative form, time-asymptotics, relaxation, small-scale dependent shocks, etc. In consequence, numerical methods should be designed in order to enjoy at the discrete level of approximation the same structural properties. The development of structure-preserving schemes is based on many interrelated methodologies: finite volume, upwind or central discretization, etc.

This includes time-asymptotic preserving methods for hyperbolic systems containing linear, as well as nonlinear, relaxation terms, and based on implicit-explicit Runge-Kutta discretizations. The proposed schemes do not require the drastic restriction on the time step which should normally be imposed by the stiff source terms. Another important example is provided by the theory of small-scale dependent shock waves, generated by diffusive-dispersive terms or associated with hyperbolic equations in a nonconservative form; the notion of schemes with controlled dissipation was introduced for such problems.

This Oberwolfach Seminar will present the foundations of the subject and overview the most recent developments on numerical methods adapted

to these problems, including the following topics: well-balanced-schemes for the shallow water equations and related models; positivity-preserving schemes; geometry-compatible schemes; schemes with controlled dissipation; small-scale dependent shocks; nonconservative hyperbolic systems; time-asymptotic preserving schemes, implicit-explicit Runge-Kutta methods for systems with relaxation.

The seminar takes place at the Mathematisches Forschungsinstitut Oberwolfach. The Institute covers board and lodging. By the support of the Carl Friedrich von Siemens Foundation travel expenses can be reimbursed up to 150 EUR in average per person (against copies of travel receipts). The number of participants is restricted to 25.

Applications including

- full name and address, incl. e-mail address
- short CV and publication list
- present position, university
- name of supervisor of Ph.D. thesis
- short summary of previous work and interest
- title, ID and date of the intended seminar

should be sent preferably by e-mail (with attachments in pdf format) via seminars@mfo.de until 15 September 2019 to:

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