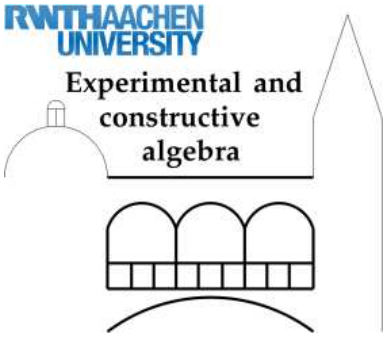
Graduiertenkolleg

Experimentelle und konstruktive Algebra



Vortragsankündigung

Donnerstag, 21. Oktober 2010, 15:15 Uhr bis 16:45 Uhr, Hörsaal V (im Hauptgebäude)

Valery Romanovski (University of Maribor, Slowenien)**:** ***Limit cycles, centers and time-reversibility in systems of polynomial differential equations***

Consider systems of differential equations of the form

$$\frac{\mathrm{d}x}{\mathrm{d}t} = P(x,y), \qquad \frac{\mathrm{d}y}{\mathrm{d}t} = Q(x,y),$$

where P, Q are polynomials of degree n, and suppose that coefficients of the polynomials are parameters. In the case when the origin of the system is a non-degenerate center (in which case all solutions close to the equilibrium one are periodic and their trajectories are closed) or a focus (in which case all solutions close to the equilibrium one are non-periodic and their trajectories are spirals), a limit cycle (an isolated periodic orbit) bifurcates from the origin, when the linearized system changes its stability. This is the well-known Andronov-Hopf bifurcation. The limit cycle bifurcations which depend on nonlinear terms of the system are much less investigated, but there is an approach to their study suggested by N.N. Bautin. Bautin also introduced the notion of cyclicity, which nowadays plays an important role in the theory of bifurcations. By the definition, the cyclicity of an elementary focus or center of a polynomial system of ODEs is the maximum number of limit cycles that can be made to bifurcate from the singularity under small perturbation of parameters of the system (the problem of cyclicity of polynomial systems is often called the local 16th Hilbert problem). In fact, the first step in the investigation of the cyclicity problem is the solution of the problem of distinguishing between a focus and a center, which is also called the Poincaré center problem. The latter problem is to separate in the space of parameters of the system the set of points, which correspond to systems having a center at the origin from those with a focus.

It can be shown that the cyclicity problem can be reduced to the problem of finding a basis of a certain polynomial ideal, and the problem of distinguishing between a center and a focus can be reduced to finding the variety of the ideal. In the talk we discuss applications of methods and algorithms of computational algebra to studying the Poincaré center problem, the cyclicity problem and the problem of time-reversibility, which is closely connected to the previous ones.

Wir laden alle Interessierten herzlich ein.

Vor dem Vortrag findet das Graduiertenkollegskaffee statt, ab 14:30 Uhr in der Bibliothek des Lehrstuhl D für Mathematik.