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MATHEMATIKKOLLOQUIUM

Das Institut für Mathematik lädt zu folgendem Vortrag ein:

Barbara Kaltenbacher

Universität Klagenfurt

Some aspects of the mathematics of nonlinear acoustics: well-posedness, coupling, and shape optimization

Nonlinear acoustics plays a role in a wide range of applications. We are especially motivated by high intensity ultrasound, which is made use of in medical therapy such as lithotripsy, but also in technical processes like ultrasould cleaning or welding. The most widely used PDE models of nonlinear acoustics are Westervelt and Kuznetsov's equation, which are evolutionary quasilinear, potentially degenerate damped wave equations typically defined on a bounded domain in R^n, n = 2 or 3. In this talk we address the issues of local and global in time well-posedness of these models with different boundary conditions. Here, the problem of appropriately extending nonhomogeneous boundary data to the interior plays a crucial role. Local analysis for small initial data is based on energy estimates together with Banach's fixed point theorem. For showing global existence we combine the energy estimates with barrier's method. Exponential decay of the boundary data are shown to yield exponential decay of the solution. We will address additional results e.g., on Neumann boundary conditions, the full Kuznetsov model, as well as coupled problems. Motivated by the application of high intensity focused ultrasound (HIFU) in lithotripsy, we consider two shape optimization problems, both being concerned with an optimal focusing of the ultrasound waves in order to concentrate the sound pressure peak to the kidney stones and avoid lesions of the surrounding tissue. In order to compute first order shape sensitivities we make use of a general approach (Ito, Kunisch, Peichl, 2008) which can be extended to the time dependent setting in a straightforward manner.

Zeit: **Donnerstag, den 20. Dezember 2012 um 17:15 Uhr**

Ort: **Bauing.-Gebäude, Technikerstraße 13, HSB 7**

Gäste sind herzlich willkommen!

Mechthild Thalhammer