Graz University of Technology

8.10.2014, 15:00–17:30 (16:00 Kaffeepause)

Seminaraum Statistik, Kopernikusgasse 23, 3. OG

Mathematisches Kolloquium

Philipp Grohs — Gisbert Wüstholz

(ETH Zürich und TU Graz)

15:00 P. Grohs: Anisotropic Structures in Numerics and Signal Processing

In many applications in numerics and signal processing, data is governed by anisotropic structures such as edges in images or shock fronts in hyperbolic PDEs. Due to the complexity of such anisotropic phenomena, their efficient approximation and resolution is challenging and, in particular, standard methods such as finite elements or wavelets fail at this task. In this talk I will present recent constructions from the world of Computational Harmonic Analysis which are capable of approximating curved singularities at an optimal rate. I will illustrate these results with applications in image processing and the numerical solution of transport PDEs.

16:30 G. Wüstholz: The triaxial ellipsoid — curvature and transcendence

There exists a canonical symmetric endomorphism S_p, the so called shape operator, of the tangent plane of the ellipsoid $\mathbb{E}$ in R^3 at $p \in \mathbb{E}$ which has as eigenvectors the direction of largest and of smallest curvature on $\mathbb{E}$. The families of eigenvectors define on $\mathbb{E}$ two vector fields X_1 and X_2 which can be integrated and give the so-called curvature lines K_1 and K_2. They are closed curves on the ellipsoid. For $\alpha \in [0, 2\pi)$ we define a new vector field $X_\alpha = X_1 \sin\alpha + X_2\alpha$ which can be integrated to give a curvature line K_α on the ellipsoid. One can now ask the question for which angles α the curvature line K_α is dense in $\mathbb{E}$. We give an answer to this question by determining the dimension of the vector space over $\overline{\mathbb{Q}}$ generated by the periods of elliptic integrals of the first, second and third kind. The latter turns out to solve an extension of a problem of Th. Schneider.

R. Tichy, J. Wallner