EINLADUNG
ZUM MATHEMATISCHEN KOLLOQUIUM

Es spricht

Dr. Friedrich Philipp
(TU Berlin)

zum Thema:

„Frames, Their Duals, Perturbations, and Dynamical Sampling"

Abstract:

Frames, originally introduced by Duffin and Schaeffer in 1952, have become a standard notion in mathematics and engineering when it comes to stable reconstruction tasks, thereby allowing redundancy. Applications range from theoretical problems such as the recently solved Kadison-Singer problem over questions in approximation theory to real-world problems in, e.g., wireless communication, coding theory, and inverse scattering problems.

In this talk we shall first give an introduction to frame theory, involving the duals and the operators associated with a frame. Dual frames are particularly important in signal processing as they allow stable recovery of a signal that was previously encoded in terms of frame coefficients.

Since (frame) measurements of real-world signals and their transmission are usually subject to perturbations such as, e.g., interference or attenuation, it seems natural to consider perturbations of frames and the effect on the corresponding duals. This is the subject of the second part of the talk. To be precise, we consider a dual pair (F, F') of frames, provide for every small perturbation G of F a dual G' of G and prove that it is a best approximation to F' in the set $\mathcal{D}(G)$ of duals of G. Using a metric $d(\cdot,\cdot)$ on the set of frames, we show that $d(F', G') \le Cd(F, G)$, where $C > 0$ depends on F and F' only. The map $F' \mapsto G'$ is shown to be bijective between $\mathcal{D}(F)$ and $\mathcal{D}(G)$.

In the third part of the talk we consider the stable reconstruction of functions $f(t,x)$ from samples at certain times t and places x when it is known that f obeys a certain partial differential equation. This relatively new subject was recently initiated by A. Aldroubi et al. and is called *Dynamical Sampling*. A generalized model consists of asking for when a sequence of the form $(A^k f_i)_{k\in\mathbb{N},i\in I}$ is a frame, where A is a selfadjoint or normal operator in a Hilbert space $\mathcal{H}$ and $f_i \in \mathcal{H}$. For example, we shall show that when A is unitary with spectral measure E, then $(A^k f)_{k\in\mathbb{N}}$ has an upper frame bound if and only if the measure $\|E(\cdot)f\|^2$ is Lipschitz continuous with respect to the arc length measure on the unit circle.

The results in the second part of the talk emerged from the collaboration with G. Kutyniok (Berlin) and V. Paternostro (Buenos Aires) while the third part is based on joint work with A. Aldroubi (Nashville, TN), C. Cabrelli (Buenos Aires), and U. Molter (Buenos Aires).

Donnerstag, 14. Januar 2016
17:30 Uhr
Raum C 113 im Curiebau

Alle Interessenten sind herzlich eingeladen.

Ilmenau, 06.01.2016 — Die Hochschullehrer des Institutes