

Abstract Vortrag von Karsten Kahl im Mathematischen Kolloquium am 29.10.2019:

## **Multigrid Methods on Structured Domains: Fundamentals, Applications and Local Fourier Analysis**

Abstract:

Multigrid methods are iterative methods for the solution of large sparse linear systems of equations which promise to require only an amount of operations to solve these systems of equations which is linear in the number of unknowns. Thus multigrid methods are coveted and it is an interesting research topic to find such methods for as many applications as possible. In this talk I want to give a short introduction to this research in terms of multigrid methods on structured domains.

In the first part of my talk I am going to introduce the fundamental concept of multigrid methods. In case the underlying problem is formulated on a regularly structured domain, i.e., a lattice or crystal structure, and the involved operators are shift invariant with respect to this structure, spectral properties of these operators can be assessed by means of Local Fourier Analysis (LFA). This in turn allows the access of asymptotic convergence rates of the iterative multigrid method, but also allows the design multigrid components based on LFA findings. In the second part of my talk I introduce a variant of LFA that is intimately coupled to the underlying structure and show that LFA can be largely automated in this formulation. I discuss the derivation of this automation process before delving into some applications in the last part of my talk.