



Numerical Analysis Seminar

Efficient solution to high-frequency Helmholtz problems with semiclassical Gabor wavelets

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Abstract

Helmholtz problems model the propagation of a scalar wave with a fixed time-frequency k . For large frequencies, these problems become increasingly difficult to solve numerically. In particular, finite element discretizations require (at least) k^d degrees of freedom (d being the number of spatial dimensions) to accurately represent the solution. In this work, I will investigate the use of alternative discretization basis that do not rely on (piecewise) polynomial functions. Indeed, I will rather employ Gabor wavelets, which are suitably scaled to match the operating frequency k . It is possible to show that such discretization spaces allow for a faithful representation of the solution with only $k^{d-1/2}$ degrees of freedom while preserving sparse matrices. In this talk, I will describe the main motivations and ideas behind this choice of basis functions. I will also sketch the proof of the error estimate mentioned above, and present numerical examples. This is a joint work with V. Dolean and M. Ingremeau.

Date:	February 19, 2025 (Wednesday)
Time:	4:00 - 5:00 pm
Venue:	ZOOM: https://hku.zoom.us/j/ Meeting ID: 913 6532 3891 Password: 310656