Discrete approximations to Fourier multipliers and applications

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Abstract: I will give an overview of recent work on discrete approximations to Fourier multipliers on $L^2(\mathbb{R}^d)$. The discrete approximations are defined on $l^2(h\mathbb{Z}^d)$, where $h > 0$ is the mesh size. We define natural discretization and embedding operators between these spaces in order to compare operator acting on different spaces. As an example of the results obtained consider the fractional Laplacians $H_0 = (-\Delta)^{s/2}$, $0 < s \leq 2$, and the corresponding discretized operators $H_{0,h}$ obtained by using the usual finite difference approximation combined with the functional calculus. Then we prove the **norm resolvent convergence** of (the embedded) $H_{0,h}$ to H_0 as $h \to 0$ with convergence rate h^s. More general results, and a recent result on discrete approximations to the Dirichlet and Neumann Laplacians on a half-space, will be presented.

Joint work with Horia Cornean (Aalborg) and Henrik Garde (Aarhus)