Hagen-Wuppertal Analysis Treffen

17. April 2018, Bergische Universität Wuppertal, Gebäude L, Hörsaal 12

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Bi-Laplacians on graphs and networks

In this paper we study the bi-Laplacian operator $A=d^4/dx^4$ acting on a finite connected network $\mathbb{G}$. We provide different equivalent representations of the possible self-adjoint vertex conditions one can endow A with. Then, we prove that the associated parabolic problem is well posed in $L^2(\mathbb{G})$ and the semigroup generated by -A extrapolates to a consistent family of semigroups on $L^p(\mathbb{G})$ for $1 \leq p \leq \infty$. Moreover, we prove that, with suitable choice of the vertex conditions and the underlying graph, $(e^{-t A})_{t\geq 0}$ is eventually positive and eventually L^∞-contractive. Furthermore, we study positivity of the semigroup generated by the bi-Laplacian on discrete graphs.