

Multigrid for solving complex-valued Helmholtz problems

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1 Failure of the Multigrid method for Helmholtz problems: analysis

1.1 Discretization

(a)

$$\begin{aligned} 10 \leq \lambda \text{ \#gridpoints} &\Leftrightarrow \\ 10 \leq \frac{2\pi}{\sqrt{|\sigma|}} \frac{1}{h^d} &\Leftrightarrow \\ \sqrt{|\sigma|} h^d \leq \frac{2\pi}{10} &\approx 0.625. \end{aligned}$$

(b)

$$\# \text{ roosterpunten} = \frac{10\sqrt{600}}{2\pi}.$$

1.2 1D model problem

test

- 1.3 LFA analysis of the ω -Jacobi smoother
- 1.4 Spectral analysis of the two-grid correction scheme
- 2 Solving the complex-valued Helmholtz problem using Multigrid
 - 2.1 1D model problem
 - 2.2 LFA analysis of the ω -Jacobi smoother
 - 2.3 Spectral analysis of the two-grid correction scheme
 - 2.4 2D model problem
 - 2.5 Aggressive coarsening
- 3 Multigrid as a preconditioner for Krylov subspace methods
 - 3.1 MG-GMRES for the indefinite Helmholtz problem