360.242 **Numerical Simulation and Scientific Computing I**, 2024W

Exercise #3: Task 2

Group 05

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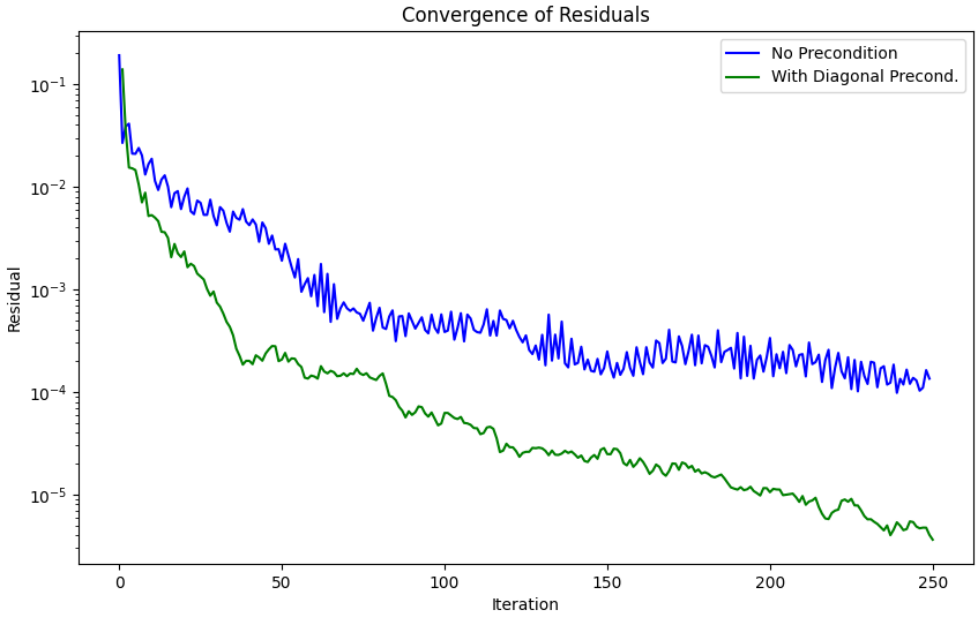
2 Conjugate Gradients in Eigen

The graph shows the convergence of residuals for two methods: the implementation of task 1 of the Conjugate Gradient (CG) method without preconditioning and Eigen's CG method with a diagonal preconditioner.



From the plot, it's clear that preconditioning significantly improves the convergence rate. Without preconditioning, the residual decreases more slowly and fluctuates as the iter-

ations increase. In contrast, the diagonal preconditioner helps Eigen's CG method converge faster and more smoothly to a smaller residual norm. This indicates that the diagonal preconditioner reduces the condition number of the matrix, making the solver more efficient.
The implementation without preconditioning of task 1 performs well but takes more iterations to reduce the residual to a similar level. This shows that preconditioning is a useful technique to improve solver performance, especially for matrices like BCSSTK11.

Build and Run

1. **make clean**: cleans up generated files
2. **make all**: compiles programme defined in `main.cpp`