Directional $\mathcal{H}^2$-Matrices for High-Frequency Electromagnetics

TECHNISCHE UNIVERSITÄT DARMSTADT

Proposal for a Master's thesis
Study field: Computational Engineering | Electrical Engineering | Mathematics | Computer Science
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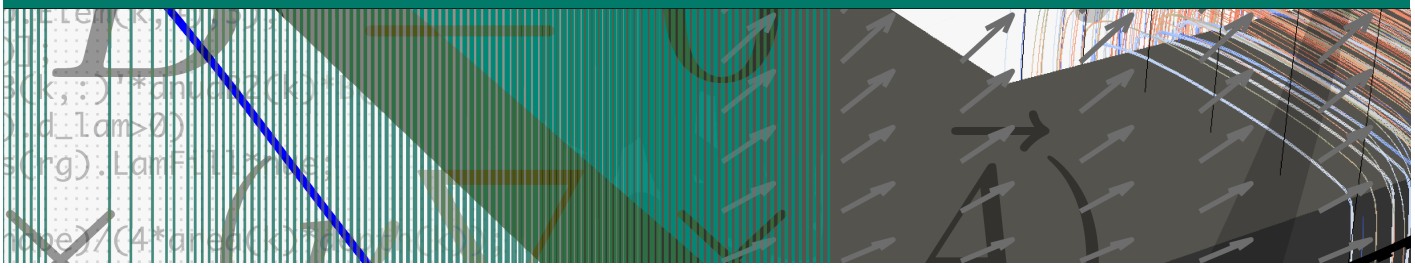

Description

Solving partial differential equations numerically with boundary element methods requires the application of fast methods to be competitive with other numerical methods. At high-frequencies, the existing implementation of $\mathcal{H}^2$-matrices breaks down and needs to be adapted in order to work efficiently.
The idea of the approach is to approximate a spherical wave in far distance hierarchically by plane waves. The implementation is carried out in the C++ library Bembel, see `www.bembel.eu`.

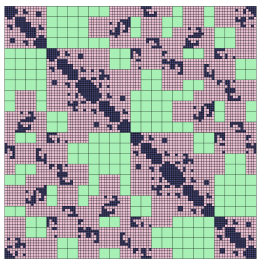

Figure 1: Illustration of a $\mathcal{H}^2$-matrix partitioning.

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Work Plan

- Study of Bembel and its software architecture, with the help of the libraries authors.
- Brief study of matrix compression methods and extending the existing framework to high-frequencies.

Prerequisites

A strong affinity to programming and experience with C/C++ (or the motivation to learn it on short term). Basic understanding of numerical schemes for the solution of partial differential equations.

CEM