ButterflyPACK

Fast direct solvers. Low-rank and butterfly compression. Distributed-memory parallel. Particularly for highly-oscillatory wave equations.
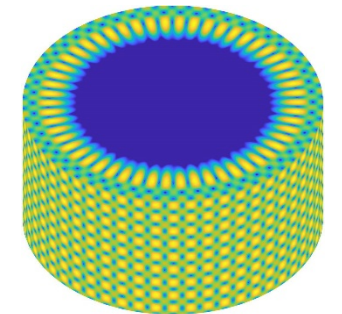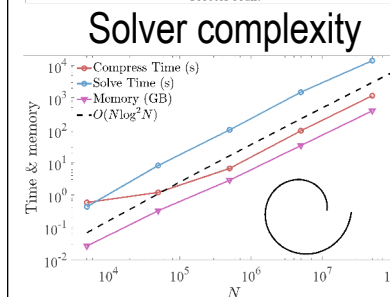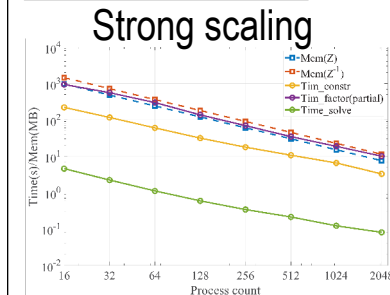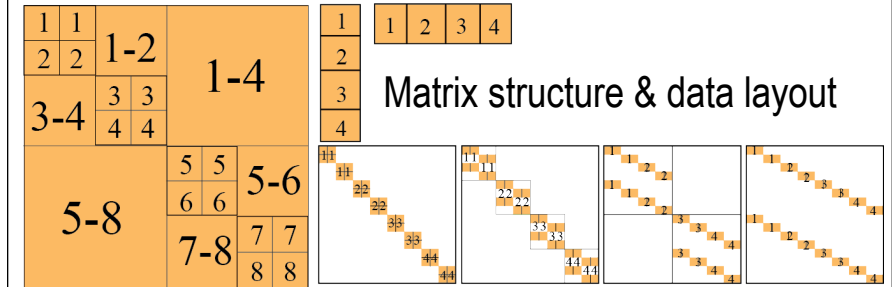
Capabilities

— Fast algebraic operations for rank-structured dense and sparse matrices, including matrix compression, multiplication, factorization and solution

— Support distributed-memory H-matrix, HODLR formats with low-rank and butterflies

— Particularly targeted at high-frequency electromagnetic, acoustic and elastic applications

Conceptual interfaces

— User input: a function to compute arbitrary matrix entries or to multiply the matrix with arbitrary vectors

— Both Fortran2008 and C++ interface available

— Highly interoperable with STRUMPACK

Open source software

— Software dependence: BLAS, LAPACK, SCALAPACK, ARPACK

— Newly released on github with tutorial examples available: https://github.com/liuyangzhuan/ButterflyPACK/tree/master/EXAMPLE

Matrix structure & data layout

Strong scaling

Solver complexity

Accelerator cavity

https://github.com/liuyangzhuan/ButterflyPACK