Diffpack® Toolboxes

The Diffpack Toolboxes plug in the power you need to address your most challenging problems.

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Datafilter Toolbox - Easy Import of External Finite Element Meshes

As a complement to the preprocessors available from the Diffpack Kernel, the Datafilter Toolbox facilitates easy and safe import of finite element meshes from external preprocessors. It can be used either as a linkable library or as a set of stand-alone programs. The industry standard formats of Abaqus, Ansys and Nastran are supported.

Adaptivity Toolbox – Fingertip Control on Adaptive Mesh Refinement

By combining the flexible finite element methods in the Diffpack Kernel with the power of the Adaptivity Toolbox, you get fingertip control over up-to-date adaptive meshing techniques to boost the accuracy and quality of your simulations. By adding a few extra statements to an existing FEM-based Diffpack simulator, you get immediate access to flexible mesh refinement strategies for structured and unstructured meshes in 1, 2 and 3 space dimensions.

Multilevel Toolbox – A Complete Framework for Multigrid Solvers

The Diffpack Multilevel Toolbox is a complete and flexible laboratory for building fast problem-dependent multigrid solvers. About 10 lines of code are all it takes to make the full gallery of multigrid options available to an existing Diffpack application. You can select structured or unstructured meshes in 1, 2 or 3 space dimensions, and the mesh hierarchy can support both nested and non-nested multigrid. You can select the pre- and post-smoothers from Diffpack's iterative solver library or you can link in your favorite smoothers from other sources. You have the same great flexibility when dealing with other parameters such as, e.g. projections, residuals, smoother sweeps, V- and W cycles. You can use the multigrid solvers directly or as preconditioners for other iterative solvers such as, e.g. the Krylov solvers available from the Diffpack Kernel.

Parallel Toolbox I – Easy Linear Algebra Parallelization for PDEs

The Parallel Toolbox I is designed to parallelize the linear algebra level of your Diffpack based PDE applications. Using a data-parallel approach, it distributes your data structures and calculations automatically to a set of processors. Data partitioning is performed in accordance with the topology of the computational mesh, which ensures balanced communication and high speed-up. When setting up your application to run in parallel, you can select most Diffpack run-time options that are available in the sequential setting. In particular, you can use structured or unstructured meshes in 1, 2 and 3 space dimensions and you can select different iterative solvers, preconditioners, elements, etc. The run-time options you can use for the parallelization setup basically include the distribution of processes to processors (often one-to-one), algorithms for mesh partitioning and the size of sub-mesh overlaps. You can choose to read each sub-mesh from file or partition a global unstructured mesh with METIS or your own mesh partitioning algorithm. Structured meshes can be constructed in parallel. The Parallel Toolbox I uses MPI as the communication protocol. As long as MPI is installed on your system, you can parallelize Diffpack applications on dedicated parallel hardware as well processors connected in a network.