Scalable parallel BEM solvers on many-core clusters

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Abstract: Our aim is to solve large scale problems discretized by the boundary element method. To this end, we propose to use parallel computers equipped with graphics processing units to assemble and solve the linear systems involved in the discretization. Depending on the application case, we either assemble the full dense system matrix (in parallel) or we compress the matrix by hierarchical matrices with adaptive cross approximation. In either case, Krylov subspace solvers are applied to solve the linear system. Our multi-GPU parallel implementation is achieved by porting a sequential CPU BEM code to GPUs and by applying a multi-GPU library for generic Krylov subspace solvers ([1, 3]) and a GPU-based hierarchical matrix library ([2]). In our presentation, we will give details on the parallel implementation and we will show our latest parallel performance benchmarks.

References

[1] P. Zaspel. `MPLA` - Massively Parallel Linear Algebra, 2017, https://github.com/zaspel/MPLA.

[2] P. Zaspel. `hmglib` - Simple H matrix library on GPU, 2017, https://github.com/zaspel/hmglib.

[3] P. Zaspel. Algorithmic patterns for $\mathcal{H}$-matrices on many-core processors, arXiv preprint: arXiv:1708.09707, 2017.