

TNL: Numerical Library for Modern Parallel Architectures

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Abstract

TNL (www.tnl-project.org) is a collection of building blocks that facilitate the development of efficient numerical solvers and HPC algorithms. It is implemented in C++ using modern programming paradigms in order to provide a flexible and user-friendly interface similar to, for example, the C++ Standard Template Library. TNL provides native support for modern hardware architectures such as multicore CPUs, GPUs, and distributed systems, which can be managed via a unified interface. In our presentation, we will demonstrate the main features of the library together with efficiency of the implemented algorithms and data structures.

References

- [1] Klinkovský J., Oberhuber T., Fučík R., Žabka V., Configurable open-source data structure for distributed conforming unstructured homogeneous meshes with GPU support, *ACM Transactions on Mathematical Software*, vol. 48, no.3, article No. 30, pp. 1–30, 2022.
- [2] Oberhuber T., Klinkovský J., Fučík R., TNL: Numerical library for modern parallel architectures, *Acta Polytechnica*, vol. 61, no. SI, pp. 122-134, 2020.
- [3] Fučík R., Klinkovský J., Solovský J., Oberhuber T., Mikyška J., Multidimensional Mixed–Hybrid Finite Element Method for Compositional Two–Phase Flow in Heterogeneous Porous Media and its Parallel Implementation on GPU, *Computer Physics Communications*, vol. 238, pp.165-180, 2019.