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Accelerating high-order mesh optimisation with an architecture-independent programming model

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Heterogeneous manycore performance-portable programming models and libraries, such as *Kokkos* [1], have been developed to facilitate portability and maintainability of high-performance computing codes and enhance their resilience to architectural changes. Here we investigate the suitability of the *Kokkos* programming model for optimizing the performance of the high-order mesh generator *NekMesh* [2], which has been developed to efficiently generate meshes containing millions of elements for industrial problems involving complex geometries. We describe the variational approach for *a posteriori* high-order mesh optimisation employed within *NekMesh* and its parallel implementation. We discuss its implementation for modern manycore massively parallel shared-memory CPU and GPU platforms using *Kokkos* and demonstrate that we achieve increased performance on multicore CPUs and accelerators compared with a native *Pthreads* implementation. Further, we show that we achieve additional speedup and cost reduction by running on GPUs without any hardware-specific code optimisation.

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