ABSTRACT

GenTen Performance Portable Dense TTM Kernels

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In this work we focus on optimizing a performance portable implementation of the tensor decomposition Technique known as the Sequentially Truncated Higher Order Singular Value Decomposition (ST-HOSVD). We aim to utilize the Kokkos programming model to facilitate an optimized implementation of the ST-HOSVD that is capable of running on all major HPC platforms, both CPU and GPU. Our goal is to apply this portable implementation to detecting anomalies in combustion simulations by decomposing small, symmetric co-kurtosis tensors via the ST-HOSVD and analyzing the results. In this endeavor, we have implemented the Gram and Tensor Times Matrix (TTM) kernels which form the computational bottleneck of the ST-HOSVD algorithm, in Sandia National Lab's GenTen framework. Here we present the TTM kernel, by comparing it against other state-of-the-art, less portable, implementations. In this manner we show that our implementations consistently outperform these for both intended and general problem sizes.