

A projection method for the construction of a low-rank tensor-structured preconditioner

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We are interested in preconditioning linear systems in tensor format arising from high dimensional stochastic partial differential equation. We propose a new algorithm for computing a low-rank approximation of the operator inverse in hierarchical Tucker format. It consists in constructing low-dimensional spaces from successive rank-one updates with prescribed properties (sparsity, symmetry). An approximation of the projection of the inverse operator into the tensor product of these spaces is then searched using hierarchical Tucker tensor format. This approximation is obtained using an alternating least square algorithm. The approximate inverse can be used as a preconditioner in itself or as a correction of an existing preconditioner.