Preconditioners for parameter-dependent equations and projection-based model reduction methods

A. Nouy[1] and O. Zahm[1]

[1]GeM UMR 6183, Ecole Centrale Nantes, Nantes, France

We present a method for the construction of preconditioners for large systems of parameter-dependent equations [1], e.g. arising from the discretization of PDEs with uncertain coefficients. The proposed preconditioner is an interpolation of the matrix inverse obtained by a projection of the identity matrix with respect to the Frobenius norm. The use of randomized linear algebra allows us to handle large matrices, with the guaranty of obtaining quasi-optimal interpolations with high probability. Adaptive interpolation strategies are then proposed for different objectives in the context of projection-based model order reduction methods: the improvement of residual-based error estimators, the improvement of the projection on a given reduced approximation space, or the recycling of computations for sampling-based model reduction methods.

References

[1] O. Zahm and A. Nouy. Interpolation of inverse operators for preconditioning parameter-dependent equations. *ArXiv e-prints*, Apr. 2015.