p-VERSION OF SPARSE GRIDS WITH APPLICATION TO PROBLEMS WITH RANDOM INPUT DATA

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Abstract. In many problems with random input parameters the mean field, the two-point correlation and the higher order moments of the solution are of interest. Using the tensorization technique, we derive a deterministic formulation for k-th order moments. Here the dimension of the computational (product) domain grows linearly with the moment index k and a full tensor product discretization would lead to a prohibitive number of unknowns already for the second moment problem (curse of dimensionality).

In this talk we develop a p-version of Sparse Grid technique for globally discontinuous discretisations. It exploits the tensor product structure of the obtained equation and allows to leave out the most of the unknowns, preserving the same up to the logarithmic factor convergence rate if the solution belongs to a certain Sobolev space with anisothropic regularity. The convergence is achieved by increasing the polynomial degree with basis functions of fixed support. As a result we obtain that the problem of finding the kth statistical moment has up to logarithmic terms the same complexity as the problem of finding the mean field.

References

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