On the Step-by-Step Construction of Polynomial Lattices for Numerical Integration in Weighted Sobolev Spaces

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Polynomial lattice point sets are special cases of digital nets, as introduced by H. Niederreiter. These point sets are polynomial versions of classical lattice point sets and among the most widely used classes of node sets for quasi-Monte Carlo integration.

In our talk, we discuss the worst case integration error of digitally shifted polynomial lattice point sets. Furthermore, we show that we can use step-by-step construction algorithms to obtain polynomial lattices which achieve a low worst case error in certain weighted Sobolev spaces. The construction algorithms presented here are so-called component by component algorithms, choosing one component of the relevant point set at a time. Furthermore, we are going to discuss under which conditions on the weights we can achieve an at most polynomial dependence of the worst case error on the dimension of the integration problem.