

On the Construction of Kernel-Based Meshfree Particle Methods in High Order Numerical Flow Simulation

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This contribution discusses the construction of meshfree methods for high order numerical flow simulation. To this end, highly flexible concepts of particle methods are utilized, where scattered data approximation algorithms are essentially required in the recovery step. We first show how kernel-based meshfree approximation can be used to obtain high order finite volume particle methods, before we discuss important aspects concerning their numerical stability and approximation behaviour in more detail. Moreover, we design customized coarsening and refinement rules for the adaptive resampling of the particles. In the construction of the proposed kernel-based particle methods, we give preference to polyharmonic spline kernels. This choice is well-motivated, as will be shown by supporting numerical examples and comparisons with other radial kernels.