

Construction of a Non-Linear Quasi-Interpolation Based on the Cubic B-Splines

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Abstract

Quasi-interpolation is a very useful tool for multivariate data approximation. It enables very large-scale data sets to be handled efficiently. The linear quasi-interpolation has advantages in simplicity and fast computation, but often suffers from ringing artifacts when approximating across discontinuities. In this regard, for a better match to the local structures, this paper presents a non-linear quasi-interpolation method. To this end, we first discuss a smoothness indicator which measures the local smoothness of the given data and then construct explicitly a local non-linear approximation scheme to approximate data with singularities. Error analysis of the proposed scheme is provided by showing that the scheme has the same approximation order as the corresponding linear B-spline method. Finally, some numerical experiments are performed to demonstrate the ability of the new scheme to reduce the ringing artifacts near discontinuities.

Keywords: Non-linear approximation, Quasi-interpolation, Cubic B-spline, Approximation order, Smoothness indicator.

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