Antialiasing 5D interpolation

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Abstract

Fourier-based minimum weighted norm interpolation (MWNI) has been widely used to regularize land seismic data. It is relatively computationally fast, and easily extends to higher dimensions. However, it has difficulty to interpolate regularly missing data that are spatially aliased. Minimizing the aliasing artifacts is still a technical challenge in MWNI. I propose a new and novel method to address the aliasing problem in MWNI. The first step involves construction of a fully regular initial model in time domain, but this initial model does not require being an accurate representation of the true data model. The spectral weights derived from this regular initial model are typically not aliased and can be used to constrain the least-squares inversion in MWNI, frequency by frequency, to overcome the aliasing artifacts. This new interpolation scheme expands the capability of the conventional MWNI to handle aliased data that often associate with steeply dipping structures. Applications of this new method on 2D synthetic and 5D field data demonstrate its effectiveness to interpolate multi-dimensional data.