MULTIDIMENSIONAL FILTERING OF IRREGULARLY SAMPLED SEISMIC DATA (MonPmOR12)

Author(s) :

Ali Özbek (Schlumberger Cambridge Research, United Kingdom)
Ralf Ferber (WesternGeco, United Kingdom)

Abstract :

In this paper, we introduce a new technique for multidimensional filtering of irregularly sampled seismic data. In this context filtering may be used for coherent noise and interference attenuation, as well as the generation of seismic images. The filtering operation consists of the convolution of the filter operator with the seismic data. The filter operator is usually computed on a regular grid (rectangular or hexagonal) that corresponds to the nominal sampling of the seismic data. Unfortunately, in the physical world the seismic data are often sampled at irregular spatial locations. Hence the two functions (the filter and the data) are defined on grids that do not match. Convolving these two functions without due regard to this fact would result in a degradation of the filtering performance. One way to solve this problem would be to interpolate the seismic data onto the regular grid. However, due to the shear volume of seismic data this approach would be prohibitively expensive in practice. We propose a methodology to solve the filtering problem in an accurate and economical way. In the proposed approach, the filter coefficients are first interpolated onto the irregular grid on which the seismic data are sampled. This is followed by the convolution of the filter operator and the seismic data over the common irregular grid.
[continued on the next page]

MULTIDIMENSIONAL FILTERING OF IRREGULARLY SAMPLED SEISMIC DATA (MonPmOR12)

Author(s) :

Ali Özbek (Schlumberger Cambridge Research, United Kingdom)
Ralf Ferber (WesternGeco, United Kingdom)

Abstract : (cont.)

The convolution requires the numerical integration of the product of two irregularly sampled spatial functions, which can be performed by a 2D generalization of the trapezoidal rule. The numerical integration can be achieved by tessellating the irregular grid through Delaunay triangularization and computing geometry−dependent scaling factors for each grid point. The interpolated filter coefficients are then scaled by the geometry−dependent weights. The resultant filter coefficients can be optionally renormalized such that the filter response within a selected subset of the multidimensional spectrum is identical to that of the ideal filter.
[continued on the next page]

MULTIDIMENSIONAL FILTERING OF IRREGULARLY SAMPLED SEISMIC DATA (MonPmOR12)

* Author(s) :	Ali Özbek	(Schlumberger Cambridge Research, United Kingdom)
	Ralf Ferber	(WesternGeco, United Kingdom)

* Abstract : (cont.)	Finally, the modified filter can be applied to the seismic data using any conventional convolution procedure.