SEISMIC IMAGE INTERPOLATION FROM IRREGULAR LOCATIONS TO A 3D GRID

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ABSTRACT

Economic and physical limitations usually impose constraints on seismic acquisition that cause irregular spatial sampling and create areas of missing traces, particularly in 3D surveys. Later processing and interpretation steps often benefit from or even require that areas of missing data be filled in and lie on a regular grid, making trace interpolation an important step in the seismic data analysis workflow. Previous work addressing this issue has relied on local slopes for interpolation, and therefore has required that traces lay at a regular spacing.

I present a method to estimate seismic images from traces at scattered, irregular locations to create an interpolated 3D volume. Dynamic time warping, a technique to correlate signals with time-varying shifts, is first used to calculate the time shifts needed to align events of the input traces in a process referred to as flattening. The flattened input traces and their associated shifts are then interpolated to regularly-spaced locations in a 3D volume using a fast gridding algorithm. The inverse interpolated shifts are then used to unflatten the interpolated seismic events, yielding the final image volume. This interpolation method does not rely on local slope information and can accommodate traces at non-uniform locations. It is also more computationally efficient than some conventional trace interpolation techniques.

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