The Borga transform

In recent years the Gabor transform has seen an increase usage in seismic data processing and analysis. We present the adjoint of the Gabor transform: the Borga transform. The Gabor transform uses the operation of first windowing and then Fourier transform while the Borga transform reverses the order so that the window is applied in the frequency domain. The result is a real-valued time-frequency decomposition that is essentially a complete set of filter slices.

 CMP gather noise attenuation

Seismic noise can be band-limited in nature and have anomalous amplitudes.

![CMP gather noise attenuation diagram](image)

Fig. 2: Blackfoot CMP NMO-corrected gather and two Borga frequency slices at 10 Hz and 40 Hz. The 10 Hz slice shows a trace with high amplitude noise, while the 40 Hz is relatively clean.

![CMP gather noise attenuation example](image)

Frequency-dependant high-amplitude data separation

The Borga transform decomposes the single sample seismic amplitude into frequency dependant amplitudes. By sorting and defining a cutoff value one can separate the anomalously high-amplitudes.

![Frequency-dependant high-amplitude data separation example](image)

Fig. 5: Input shot gather from the Blackfoot survey has been separated into two gathers, one with ‘reasonable’ amplitudes and one with very high amplitudes, mostly ground roll.

Time-variant spectral whitening

The Borga transform decomposes the seismic trace into a complete set of filter slices, which makes it a natural candidate to perform time-variant spectral whitening.

![Time-variant spectral whitening example](image)

Fig. 6: Shot gather time-variant spectral whitening.