

Mel Cepstrum techniques for event identification

The goal of this study is to outline the advantages, applicability and performance of Mel Cepstrum (MC) techniques for seismic and infrasound event identification. MC has been traditionally used for speech recognition at Mel Frequencies (MF), which are equally spaced frequencies on a logarithmic scale. In this study, MC coefficients are used for feature extraction on seismic and infrasound signals. It is assumed that some types of event sources have frequency-power signatures which may be visible in the MC coefficients. To estimate the MC, in each data window the log energy is computed in twenty triangular, overlapping band pass filters, centered on each MF, which are applied to the Fourier transform spectral magnitude. A discrete cosine transform is applied to convert the log power spectrum from MF domain to time domain, and the MC coefficients are estimated. Preliminary results using MC for event identification are promising, and suggest that some event categories, such as atmospheric nuclear explosions (Operation Dominic in the 1950's), have consistent MC, especially consistent differential MC coefficients in neighboring MF bands.

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