Multivariate Iterative Filtering as a stable and fast alternative technique to Multivariate EMD for multidimensional nonstationary signals decomposition

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In recent years the well known Empirical Mode Decomposition (EMD) method has been extended to decompose multidimensional signals which evolve over time in what is known as Multivariate EMD. This extended method however suffers the same issues as EMD. In particular it requires to be run hundreds of times to make the decompositions stable, the well known Ensemble EMD, and its mathematical properties are still unknown making it de facto a black box.

Few years ago the so called Iterative Filtering (IF) algorithm has been introduced as an alternative method to the EMD. This newly developed method, which allows to decompose nonstationary signals in a similar fashion to what EMD does, has been completely analyzed from a mathematical standpoint. Thanks to this analysis the method has been accelerated by means of the Fast Fourier Transform and its convergence to a meaningful decomposition can be guaranteed a priori for any signal.

We present here the Multivariate Iterative Filtering which is the extension of the IF method to the case of multidimensional signals which evolve over time. We show the application of this technique to the decomposition of geophysical signals.