Speech Analysis by Time-varying Lattice Filters

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abstract: In [1], the time-varying coefficients are determined from a single frame by a least square estimation using basis functions for the parameter trajectories. An estimation algorithm for the analysis of adjacent frames is given in [2-3], which yields the optimum coefficients in terms of the direct form under the constraints of a continuous trajectory. In [4] a method is proposed which computes time-varying reflection coefficients from a single frame by using basis functions. In comparison to the approach of [4], in this contribution an algorithm is proposed which analyses a sequence of adjacent frames by a FIR lattice filter on the constraints of continuously connected coefficient trajectories between the frames. For that purpose, the frames are analyzed jointly once after the other to fulfill the continuous condition.

Continuous conditions

\[ x(n) = \sum_{i=1}^{M} a_i^c(n) y(n-i) + e(n) \]

\[ e(n) \text{ is determined from } a_i^c(n) = \phi(n) a_i^c(n) \]

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Effect of segment lengths

![Effect of segment lengths](image)

Trajectory of magnitude responses by the time-varying analysis of utterance [laN@vaIl@] with equal distances of 120 samples and different parameter settings: L=350 and M=200 for (a), L=120 and M=200 for (b), L=120 and M=100 for (c), and M=500 for (d).