ANALYSIS OF SHORT TIME SPEECH SEGMENTS BASED ON LINEAR PREDICTION

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We present a new method of analysis of short data records that will enable us to process nonstationary signals like speech. The method uses standard autocorrelation-based linear prediction (LP) analysis in two phases. In the first phase a low order LP analysis is used to pick up the gross features of the spectral envelope. The LP residual from the first phase is used to modify the LP spectrum in the second phase to capture the details over a short segment of analysis frame. By this method we try to reduce the finite window effects for short time segment analysis. We make use of the fact that the correlation within the samples of the LP residual is less compared to that of the actual signal. Hence effects of short window size are smaller in the LP residual than in the case of the actual signal.

This analysis is particularly relevant for nonstationary signals like speech. In voiced speech, the signal is not strictly stationary even within a pitch period due to changes in the vocal tract system characteristics at the glottis (1). In the open phase of the glottal cycle, the damping of the vocal tract resonances increases due to energy leakage through glottis (2). The source-tract interaction in each pitch period cannot easily be detected by the conventional speech analysis methods based on the assumption of quasi-stationarity (3). We show that the present analysis enables one to capture the details of variations in the spectral envelope over short data records and thus makes it possible to estimate the presence of the source-tract interaction also. We develop the theoretical basis for this analysis and demonstrate the performance of our method through several illustrative examples.

REFERENCES

