EVALUATION OF DIFFERENT EXCITATION GENERATION ALGORITHMS FOR ARTIFICIAL BANDWIDTH EXTENSION

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Abstract: Artificial bandwidth extension (ABWE) is still an important topic in mobile telephony, especially when a 16-kHz wideband call suddenly falls back to an 8-kHz GSM connection. The aim of ABWE is to bridge the arising voice quality gap by reconstructing the wideband signal. In order to achieve this, the signal is typically decomposed into a spectral envelope and an excitation signal, both of which are then extended separately. While the algorithms for envelope extension are getting increasingly more sophisticated, excitation generation is still often performed with rudimentary methods such as spectral folding (aliasing) or spectral shifting (modulation). But this can introduce audible artifacts, especially for speech signals where the pitch frequency varies a lot. To reduce these artifacts, we propose an algorithm that shifts parts of the spectrum multiple times by a smaller frequency shift. And we investigate if the speech quality can be further improved by interpolating the extended excitation signal with white noise. This is motivated by the fact that the SNR of the harmonic excitation decreases towards higher frequencies for real wideband signals. The performance of the proposed algorithm is evaluated and compared to spectral folding and spectral shifting.