Effects of Expanding Envelope Fluctuations on Consonant Perception in Hearing-Impaired Listeners

This study examined the perceptual consequences of three speech enhancement schemes based on multiband nonlinear expansion of temporal envelope fluctuations between 10 and 20 Hz: (a) "idealized" envelope expansion of the speech before the addition of stationary background noise, (b) envelope expansion of the noisy speech, and (c) envelope expansion of only those time-frequency segments of the noisy speech that exhibited signal-to-noise ratios (SNRs) above 10 dB. Linear processing was considered as a reference condition. The performance was evaluated by measuring consonant recognition and consonant confusions in normal-hearing and hearing-impaired listeners using consonant-vowel nonsense syllables presented in background noise. Envelope expansion of the noisy speech showed no significant effect on the overall consonant recognition performance relative to linear processing. In contrast, SNR-based envelope expansion of the noisy speech improved the overall consonant recognition performance equivalent to a 1- to 2-dB improvement in SNR, mainly by improving the recognition of some of the stop consonants. The effect of the SNR-based envelope expansion was similar to the effect of envelope-expanding the clean speech before the addition of noise.

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