World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:12, No:10, 2018

Effect of Noise Reduction Algorithms on Temporal Splitting of Speech Signal to Improve Speech Perception for Binaural Hearing Aids

Authors : Rajani S. Pujar, Pandurangarao N. Kulkarni

Abstract : Increased temporal masking affects the speech perception in persons with sensorineural hearing impairment especially under adverse listening conditions. This paper presents a cascaded scheme, which employs a noise reduction algorithm as well as temporal splitting of the speech signal. Earlier investigations have shown that by splitting the speech temporally and presenting alternate segments to the two ears help in reducing the effect of temporal masking. In this technique, the speech signal is processed by two fading functions, complementary to each other, and presented to left and right ears for binaural dichotic presentation. In the present study, half cosine signal is used as a fading function with crossover gain of 6 dB for the perceptual balance of loudness. Temporal splitting is combined with noise reduction algorithm to improve speech perception in the background noise. Two noise reduction schemes, namely spectral subtraction and Wiener filter are used. Listening tests were conducted on six normal-hearing subjects, with sensorineural loss simulated by adding broadband noise to the speech signal at different signal-to-noise ratios (∞, 3, 0, and -3 dB). Objective evaluation using PESQ was also carried out. The MOS score for VCV syllable /asha/ for SNR values of ∞, 3, 0, and -3 dB were 5, 4.46, 4.4 and 4.05 respectively, while the corresponding MOS scores for unprocessed speech were 5, 1.2, 0.9 and 0.65, indicating significant improvement in the perceived speech quality for the proposed scheme compared to the unprocessed speech.

Keywords : MOS, PESQ, spectral subtraction, temporal splitting, wiener filter
Conference Title : ICA 2018 : International Conference on Acoustics
Conference Location : Tokyo, Japan
Conference Dates : October 08-09, 2018