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A Simple Adaptive Atomic Decomposition Voice Activity Detector Implemented by Matching Pursuit

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Abstract : A simple adaptive voice activity detector (VAD) is implemented using Gabor and gammatone atomic decomposition of speech for high Gaussian noise environments. Matching pursuit is used for atomic decomposition, and is shown to achieve optimal speech detection capability at high data compression rates for low signal to noise ratios. The most active dictionary elements found by matching pursuit are used for the signal reconstruction so that the algorithm adapts to the individual speakers dominant time-frequency characteristics. Speech has a high peak to average ratio enabling matching pursuit greedy heuristic of highest inner products to isolate high energy speech components in high noise environments. Gabor and gammatone atoms are both investigated with identical logarithmically spaced center frequencies, and similar bandwidths. The algorithm performs equally well for both Gabor and gammatone atoms with no significant statistical differences. The algorithm achieves 70% accuracy at a 0 dB SNR, 90% accuracy at a 5 dB SNR and 98% accuracy at a 20dB SNR using 30dB SNR as a reference for voice activity.

Keywords : atomic decomposition, gabor, gammatone, matching pursuit, voice activity detection
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