
**Abstract**

The need for noise reduction arises in speech communication channels, such as ground-to-air transmission and ground-based cellular radio, to improve vocoder quality and speech recognition accuracy. In this paper, noise reduction is performed in the context of a high-quality harmonic zero-phase sine-wave analysis/synthesis system which is characterized by sine-wave amplitudes, a voicing probability, and a fundamental frequency. Least-squared error estimation of a harmonic sine-wave representation leads to a "soft decision" template estimate consisting of sine-wave amplitudes and a voicing probability. The least-squares solution is modified to use template-matching with "nearest neighbors." The reconstruction is improved by using the modified least-squares solution only in spectral regions with low signal-to-noise ratio. The results, although preliminary, provide evidence that harmonic zero-phase sine-wave analysis/synthesis, combined with effective estimation of sine-wave amplitudes and probability of voicing, offers a promising approach to noise reduction.