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Robust and Transparent Spread Spectrum Audio Watermarking

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Abstract : In this paper, we propose a blind and robust audio watermarking scheme based on spread spectrum in Discrete Wavelet Transform (DWT) domain. Watermarks are embedded in the low-frequency coefficients, which is less audible. The key idea is dividing the audio signal into small frames, and magnitude of the 6th level of DWT approximation coefficients is modifying based upon the Direct Sequence Spread Spectrum (DSSS) technique. Also, the psychoacoustic model for enhancing in imperceptibility, as well as Savitsky-Golay filter for increasing accuracy in extraction, is used. The experimental results illustrate high robustness against most common attacks, i.e. Gaussian noise addition, Low pass filter, Resampling, Requantizing, MP3 compression, without significant perceptual distortion (ODG is higher than -1). The proposed scheme has about 83 bps data payload.

Keywords : audio watermarking, spread spectrum, discrete wavelet transform, psychoacoustic, Savitsky-Golay filter
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