

ABSTRACT

Quantization index modulation is one of the best methods of blind watermarking, due to its simplicity, low complexity, and good rate-distortion-robustness trade-offs. This thesis deals with a study of audio watermarking algorithms based on quantization. The main results include the development of five novel audio watermarking algorithms providing performance enhancements over existing algorithms. This is accompanied by extensive experimentation to validate the performance benefits of the proposed algorithms, in presence of standard watermarking attacks.

The first proposal is of a blind audio watermarking algorithm using quantization using singular value decomposition. In this algorithm, watermark data is embedded by quantizing largest singular value coefficients. The robustness of the proposed algorithm against different signal processing and stirmark attacks is tested. The proposed algorithm is established to perform better than some of the published audio watermarking algorithms.

The second proposal deals with a novel oblivious audio watermarking algorithm based on norm quantization using singular value decomposition. The robustness of this algorithm against different signal processing and stirmark attacks is studied, and its performance is found to be better than some of the published audio watermarking algorithms available in the literature.

Third, we introduce an adaptive blind audio watermarking algorithm based on singular value decomposition and quantization. This algorithm embeds watermark data by applying a quantization process on the singular values in the singular value decomposition of the audio signal blocks. The proposed algorithm has good imperceptibility, higher payload and superior performance compared to earlier audio watermarking algorithms.

Our fourth algorithm uses a new blind audio watermarking algorithm based on singular value decomposition and quantization. The watermark insertion and extraction

processes are based on the quantization of the singular values of the blocks of the host audio signal. This algorithm has higher data capacity and better robustness compared to published audio watermarking algorithms.

The last proposal focuses on an oblivious audio watermarking algorithm based on singular value decomposition and dither-modulation quantization. The watermark is embedded using dither-modulation quantization of the singular values of the blocks of the host audio signal. Experimental results indicate that the proposed algorithm is significantly better than published audio watermarking algorithms in terms of imperceptibility, data payload and robustness against signal processing and stirmark attacks.

Keywords: Audio watermarking, Blind watermarking, Cepstrum domain, Discrete wavelet transform (DWT), Dither modulation (DM), Quantization index modulation (QIM), Singular value decomposition (SVD).