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Watermarking via zero assigned filter banks

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ABSTRACT

In order to identify the owner and distributor of digital data, a watermarking scheme in frequency domain for multimedia files is proposed. The scheme satisfies the imperceptibility and persistence requirements and it is robust against additive noise. It consists of a few stages of wavelet decomposition of several subblocks of the original signal using special zero assigned filter banks. By assigning zeros to filters on the high frequency portion of the spectrum, filter banks with frequency selective response are obtained. The information is then inserted in the wavelet-decomposed and compressed signal. Several robustness tests are performed on male voice, female voice, and music files, color and gray level images. The algorithm is tested under white Gaussian noise and against JPEG compression and it is observed to be robust even when exposed to high levels of corruption.

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1. Introduction

Due to the recent developments in Internet and multimedia services, digital data have become easily attainable through the World Wide Web. Properties such as error-free reproduction, efficient processing and storage, and a uniform format for digital applications, make digital technology popular. However, these advantages may present many complications for the owner of the multimedia data. Unrestricted access to intellectual property and the ease of copying digital files raise the problem of copyright protection.

In order to approve rightful ownership and prevent unauthorized copying and distribution of multimedia data, digital watermarking is employed and imperceptible data are embedded into digital media files. Watermarking makes it possible not only to identify the owner or distributor of digital files but also to track the creation or manipulation of audio, image or video signals. Moreover, by embedding a digital signature, one may provide different access levels to different users. There are several essential conditions that must be met by an effective watermarking algorithm.

(i) The signature of the author, the watermark, needs to be not only transparent to the user but also robust against attacks [8]. These attacks may include degradations resulting from a transmission channel, compression of the signal, rotation, filtering, permutations or quantization.
(ii) The watermarking procedure should be invertible. The watermark must be recovered from the marked data preferably without accessing the original signal.
(iii) The marking procedure must be able to resolve rightful ownership when multiple ownership claims are made. A pirate may modify the marked signal in a way that if his fake original signal is used in detection process, both claimers may gather equal evidence for ownership [13]. This situation is called the deadlock problem [8]. The importance of decoding without the original signal arises here.
(iv) The author should provide secret keys in order to obtain a more secure encryption technique that allows only the authorized detections of the water-

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