

Chapter 16

Digital Watermarking: Technical Art of Hiding a Message

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ABSTRACT

Nowadays, Multimedia contents such as images, videos, e-books and texts are easy to available for download through internet in worldwide. Duplication of multimedia contents is to create using different software. This type of operation some time created problem of copyright and ownership authentication. Digital watermarking techniques are one of the solutions for providing protection to multimedia contents. This chapter gives various watermarking techniques in transform domain and sparse domain for protection of multimedia contents. This chapter has demonstrated various watermarking techniques such as Discrete Cosine Transform (DCT), Discrete Wavelet Transform (DWT), Singular Value Decomposition (SVD), Fast Discrete Curvelet Transform (FDCT), and CS theory based technique. All watermarking techniques can be applicable to every type of multimedia contents such as grayscale images or videos and color image or videos.

1. INTRODUCTION

In the 21st century, the multimedia contents such as images, videos and texts are easy to share using the internet. The easy transfer facilitates of internet to transfer multimedia contents with one user to another user with modification, distribution, subscription and trading of various digital contents such as databases, e-books, images and videos without the owner's consent. Sometimes, owners are unwilling to distribute digital contents on the internet because of lack of security of digital contents on public networks. The availability of advance software on the internet and the market provides duplication of these digital contents is easy without owner acknowledgement. This prevents issues of copyright protection and copyright authentication of digital contents. Digital watermarking techniques are providing

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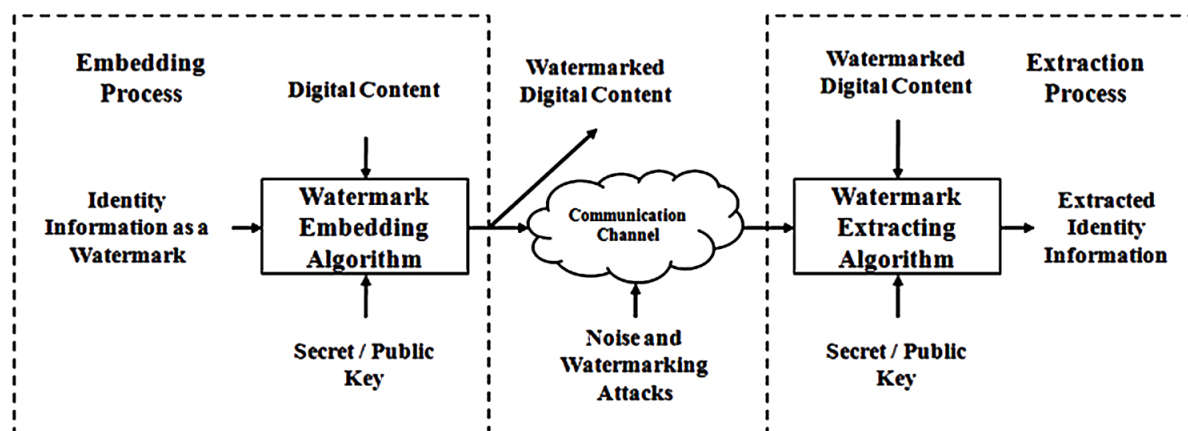
security against these issues. The digital signature contents could reduce copyright violation and help to determine ownership of contents.

The best possible way, in which the multimedia contents are protected against illegal duplication, is to put some identity information behind the multimedia content for the authentication of the owner. This identifying information is called as “watermark”. The technique is known as Digital Watermarking (Wolfgang & Podilchuk, 1999; Langelaar, Setyawan & Lagendijk, 2000) which is a state of art technique to insert a identity information behind the multimedia content in such a manner that the authorized or public can’t visualize the identity information with common human visualization system (HVS). The identity information may be name of the owner, company logo or any important information which can be getting after application of specific algorithm and in this way the proof of ownership can be got. The prevent security to proof of ownership and avoid unauthorized tampering of important multimedia contents, the industry and researchers are developing various digital watermarking techniques. These techniques are proposed for various application areas such as copyright protection and authentication, source tracking, broadcast monitoring, video authentication, access control and biometric template protection.

The term “watermark” was coming from the German word “watermarke”. The name is probably given because of the identity information resembles the effects of water on paper. Paper watermarks are used in the art of papermaking in Fabriano, Italy nearly 700 years ago (Kim & Ro, 2004; Hartung & Kutter, 1999). Watermarks are initially used for indicating brand of paper and mill information which produced the paper. The first example of a technology which is similar to the digital watermarking technique is a patented by Emil Hembrooke for identifying music works in 1954 (Bender et al., 1996). In 1988, Komatsu and Tominaga first time used term of “digital watermarking” (Cox, Shamoon & Leighton, 1997). The interest in digital watermarking techniques began to mushroom after 1995.

Digital Watermarking technique is the process of inserting digital information into host digital content. The digital information can be identified by the owner of the work, authentication content. The host digital content could be a still image, an audio clip, a video clip, a text document or digital data which owner would like to protect (Langelaar, Setyawan & Lagendijk, 2000). A watermarking system can be treated as a simple digital communication system. This system has three main components such as an embedder or encoder; transmission medium which is optional; a detector or decoder. The general watermarking system is shown in figure 1. The embedder or encoder is inserted or encoded the water-

Figure 1. General digital watermarking system



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