

Chapter 61

Intelligence–Based Adaptive Digital Watermarking for Images in Wavelet Transform Domain

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ABSTRACT

Advances in technologies facilitate the end users to carry out unauthorized manipulation and duplication of multimedia data with less effort. Because of these advancements, the two most commonly encountered problems are (1) copyright protection and (2) unauthorized manipulation of multimedia data. Thus a scheme is required to protect multimedia data from those two above said problems. Digital Watermarking is considered as one of the security mechanisms to protect copyrights of multimedia data. The literature review reveals that the calculation of scaling and embedding parameters are not completely automated. In order to automate the procedure of calculating scaling and embedding parameters the computational intelligence need to be incorporated in the watermarking algorithm. Moreover the quality of the watermarked images could also be preserved by combining computational intelligence concepts. Thus watermarking schemes utilizing computational intelligence concepts could be called as intelligence based watermarking schemes and it is presented in this chapter in detail.

INTRODUCTION

Information sharing becomes very easy in Internet that permits the unauthorized manipulations of multimedia data with reduced efforts. In such circumstances protecting copyrights of multimedia data become very essential as cost involved in content development is very high. In Internet, huge volume of data available in the form of images, thus it is required to secure images in particular. Digital watermarking

DOI: 10.4018/978-1-5225-0983-7.ch061

is considered as a most popular security mechanism to protect copyrights of digital images. In general digital watermarking techniques are carried out by inserting a piece of digital data in to a cover data. In order to keep the watermark inside a cover image, its content needs to be altered without affecting its quality. The amount of alteration of cover images decides the quality of cover images. Digital image watermarking techniques are broadly classified into spatial domain and frequency domain techniques. Researcher have carried out watermarking schemes in both working domains, but in order to make watermarking schemes robust it has to be carried out in frequency domain. In this chapter, watermarking schemes carried out in wavelet transform domain combined with computational intelligence are presented. In the subsequent sections, the basics of digital watermarking, watermarking in transform domain, computational intelligence based watermarking schemes and conclusion are discussed in detail.

BASICS OF DIGITAL WATERMARKING

Digital Watermarking is defined as a process of inserting a piece of digital data called watermark into digital images that are to be protected. The watermark to be inserted can be of logo, text data, numbers or any other type of images. The cover data could be of digital images, digital video sequences and digital audio signal. The inserted watermark should be extractable in future for verification of it to the intended purposes. One of the important properties of digital watermarking is its robustness against various attacks. Robustness is defined as the existence of the watermark even after various attacks as discussed in Hartung & Kutter (1999).

Steganography is a technique using which secret information could be hidden within another unrelated cover image for secret communication. Some of the techniques of steganography include spacing patterns in printed documents, coding messages in music compositions etc as outlined in Anderson & Petitcolas (1998)'s work. The other applications include ownership protection, proof of ownership, fingerprinting, authentication and tampering detection if the robustness property is also considered.

Digital Watermarking can be considered as a special technique of steganography where the secret information could be inserted into any other media data which may be related to each other. The most common examples of watermarking are the presence of specific patterns in currency notes, which are visible only when the note is exposed to light and company logos in the background of printed text documents. In some applications invisible watermarking could also be carried out. The watermarking techniques prevent forgery and unauthorized replication of any digital content.

Working Principle of Digital Watermarking

The general image watermarking system consists of a watermark, embedding algorithm and extraction algorithm. The embedding algorithm takes cover image and watermark as input and produce watermarked image as output. Similarly the watermark extraction algorithm takes watermarked image as input and extract watermark from it. Based on the requirements of original images the watermarking schemes could be classified into non-blind watermarking schemes or blind watermarking schemes. In this chapter the non-blind adaptive watermarking schemes using wavelet transform techniques combined with computational intelligence are presented.

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