Chapter 3.9
Image Watermarking

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ABSTRACT

This chapter describes image watermarking, the most common and widespread category of media files are images. The evolution of the Internet and the ease by which images can be duplicated and distributed has led to the need for effective copyright protection tools and techniques in order to provide a secure way to the producers and the owners of these media files. These techniques are described below with an introduction to information hiding. Various software products have been introduced with an aim to address these growing concerns; some categories are presented here. The fundamental technique which allows an individual to add hidden copyright notices or other verification messages to digital images is called digital image watermarking and constitutes the main part of the chapter. Finally authors provide future trends and directions of image watermarking.

INTRODUCTION

For the past few years, little focus has been given to copyright issues of digital media. However, as the World Wide Web becomes a dominant Internet tool, providing huge volumes of information, many copyright owners are concerned about protecting the copyright of their digital images. Digital watermarking is an appropriate solution that can assist to ensure their rights. This technology allows a secret message to be hidden in an image file, without the detection of the user. The watermark is not apparent to the user, and does not affect in any way the use of the original file. The watermarking information is predominantly used to identify the creator of a digital image file.

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BACKGROUND

The growth of computer networks has helped any type of information to be transmitted and

exchanged over the Internet. Due to the convenience of copy and reproduction of digital images, the copyright protection issue is nowadays more important in the Internet environment. Moreover there are many modern digital libraries that have replaced the conventional. All these facts in combination with the ease of duplication of digital information have led to the need for effective copyright techniques and tools for protecting digital image copyright. Image watermarking has come to prevent from the unauthorized use of the images commercially. Watermark as a technique is an invisible signature embedded inside an image to show authenticity or proof of ownership. This method discourages unauthorized copying and distribution of images especially over the Internet and ensures that a digital picture has not been altered.

HISTORY OF INFORMATION HIDING

In this section we are going to give some important landmarks about information hiding without intending to cover the whole history of it. Information hiding techniques belong to a wide category of techniques that try to embed a signal, called digital signature or copyright label or watermark in the initial data. These techniques combine many different scientific areas like cryptography, digital signal processing, communication theory, etc. Generally there are two basic methods of information hiding, cryptography and steganography which overlap in some cases because they share some techniques.

Cryptography is about protecting the content of a message with the use of disguise. The initial message is called the *plain text* and the disguised message is called the *cipher text*. The process of converting this plain text to a cipher text is called enciphering or in other words encryption. The opposite process is called deciphering or decryption. Encryption protects content during the transmission of the data from the sender to receiver. However, after receipt and subsequent decryption, the data is no longer protected and is clear. While cryptography is about protecting the content of messages, steganography is about concealing their very existence.

Steganography lies in devising astute and undetectable methods of concealing the message themselves. It comes from Greek roots (στεγανός, γραφείν), literally meaning «covered writing» (Clarendon Press, 1933), and is usually interpreted to mean hiding information in other information. Examples include sending a message to a spy by marking certain letters in a newspaper using invisible ink. Steganography hides messages in plain sight rather than encrypting the message. It is embedded in the data and does not require secret transmission. A whole other branch of steganography is linguistic steganography which consists of linguistic or language forms of hidden writing (David Kahn, 1996).

There has been a growing interest, by different research communities, in the fields of steganography, digital watermarking and fingerprinting. This led to some confusion in the terminology. For this reason in Figure 1 we present a classification of various information hiding techniques.

DIGITAL WATERMARKING

Digital watermarking technology is an emerging field in computer science, cryptography, signal processing and communications. A digital watermark is a signal which is permanently embedded into digital data like images, audio, etc. This signal can be detected or extracted by special programs in order to make assertions about the data. After this procedure the watermark is hidden in the host data in a way that it is inseparable from the data and it is resistant to many operations such as degrading the host file. Finally the work is still accessible but permanently marked. Digital watermarking is an enabling technology for several applications and strategies which can provide many advantages.