



Chapter XXI

Multimedia Copyright Protection

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ABSTRACT

Internet and its widespread usage for multimedia document distribution put the copyright issue in a complete new setting. Multimedia documents, specifically those installed on a web page, are no longer passive as they typically include active applets. Copyright protection safeguards the intellectual property (IP) of multimedia documents, which are either sold or distributed free of charge. In this Chapter, the basic tools for copyright protection are discussed. First, general concepts and the vocabulary used in copyright protection of multimedia documents are discussed. Later, taxonomy of watermarking and fingerprinting techniques are studied. This part is concluded by a review of the literature dealing with IP security. The main part of the chapter discusses the generic watermarking scheme and illustrates it on three specific examples: collusion-free watermarking, spread spectrum watermarking, and software fingerprinting. Future trends and conclusions close the chapter.

INTRODUCTION

Copyrighted multimedia documents traditionally include all works whose creator claims exclusive ownership and these claims are supported by an appropriate legislation. In many cases, the creator of the document may not hold copyrights. This happens when an author publishes their book using a well-known publisher. The author signs a contract with the publisher transferring their rights in exchange for royalties. In this case the publisher becomes the copyright holder of the book. Unlike the patenting law which protects only those who have lodged an appropriate application and have received a pending patent on their work, the copyright legislation guards every document whose owner puts the © logo on it (with date) and can prove ownership at court. In case of a dispute, the party with earlier copyright is considered to be the rightful owner.

The digital environment such as computer systems or networks (the Internet) has many properties that are unique. One of them is the ease in which multimedia documents can be replicated. A simple execution of the copy operation generates a new copy of the document, indistinguishable from the original. The collection of multimedia documents normally includes text, software, audio, video, graphics and animation data. An excellent example of multimedia documents is a web page which normally includes a rich blend of not only passive electronic documents but also more importantly active documents such as applets or Java scripts (software).

Most of the copyrighted documents can be used legally for non-profit purposes when its original source is gratefully acknowledged. However, this is not the case when a copyrighted work is being copied and sold without permission from the copyright holder. Copyright protection has become of utmost importance to companies and individuals that are selling audio and video CD, software and other multimedia products. Electronic commerce (e-Commerce) is growing rapidly not only because transactions can be performed via the Internet, but more importantly, because products can be shipped to the buyers via the Internet.

Copyright protection uses steganography and cryptography. Steganography uses a variety of techniques of information hiding so the information is invisible to an observer. A classical example is the use of invisible ink. On the other hand, cryptography scrambles the information so although visible, is unintelligible. The main difference between the two is the assumption about potential adversaries. Steganography works only if adversaries do not know the protection measures or they are unable to figure out the hidden information. Cryptography relies on the assumption that the protection is controlled by a secret key whose value is not known to adversaries. Clearly, if adversaries are security experts than steganography may not work. Cryptography works no matter who are the adversaries provided they do not know the secret key. Another advantage of cryptography over steganography is that in case of a successful attack, simply replacing the compromised key with a new one can easily restore the security. This is not applicable to steganography, as a new hiding scheme must be invented which replaces the compromised one.

The objectives of this Chapter are to present:

- taxonomy of copyright protection methods,
- protection methods for multimedia (passive) documents,
- software protection methods.

BACKGROUND

From now on, we refer to a multimedia *document* as being an original work (such as text, music, sound, picture, video, software, etc.) transformed into an electronic form. A *watermark* is information, which is embedded in a document for copyright protection purposes.

An adversary is an umbrella name for a wide range of unfriendly or perhaps malicious people who would like to infringe copyrights of the rightful owner of a multimedia document. Some of the adversarial activities may include

- replication of a document (possibly for illegal distribution),
- modification of a document (with an intent to distribute copies of the modified document). The modification can be as simple as removing parts of the documents. For instance, a picture is enlarged and margins cut off,

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