

A Survey of Digital Watermarking Techniques

Neha Singh, Mamta Jain, Sunil Sharma

Abstract—The enormous popularity of the World Wide Web in the early 1990's demonstrated the commercial potential of offering multimedia resources through the digital networks. Since commercial interests seek to use the digital networks to offer digital media for profit, they have a strong interest in protecting their ownership rights. Since the threat of using multimedia information, digital forgeries, and unauthorized sharing (piracy) of digital content have increased among content creators, distributors and users. Today multimedia information piracy alone has subjected all the industries to multi-billion revenue losses. Traditional digital content protection techniques, such as encryption and scrambling, alone cannot provide adequate protection of copyrighted contents, because these technologies are unable to protect digital content once they are decrypted. One way to discourage illegal duplication is to insert information known as watermark, into potentially vulnerable data in such a way that it is impossible to separate the watermark from the data. Digital watermarking is the process of inserting a digital signal or pattern inside a digital image, which provides evidence of authenticity. This paper presents a survey on various information hiding techniques and describes classification of digital Watermarking techniques.

Index Terms— Copyright Protection, Embedding, Information Hiding, Watermarking.

I. INTRODUCTION

Editing, distribution and reproduction of the private digital multimedia are becoming extremely easier and faster with the existence of the internet and the availability of pervasive and powerful multimedia tools. The problems of illegal duplication, fake currency, business security, protecting intellectual property etc. are becoming more and more important. Digital watermarking has emerged as a possible method to tackle these issues. Digital images are the most popular carrier file format among various available formats like audio files, video files, and text files because of their frequency on the Internet. Until now, intellectual property and value has always been bound to some physical container that could not be easily duplicated, thereby guaranteeing that the creator benefits from his work. Therefore information hiding techniques plays a vital role for providing copyright authentication.

II. HISTORY OF INFORMATION HIDING

In ancient times, the messages were sent on foots. There are only two options to hide a message: hide it on the messenger, or have the messenger memorize it.

Manuscript received 20 August, 2013.

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The practice and idea of information hiding has a long history. According to Greek historian Herodotus around 440 B.C., the famous Greek tyrant Histiaeus [1]-[3], while in prison, used to send message to his son-in-law by shaving the head of his trusted slave to tattoo a message on his scalp. He dispatched the slave with the hidden message when the hair grew back.

The second story also came from Herodotus, which says that a soldier named Demeratus [1] used wax-covered tablet to send a message to Sparta that Xerxes intended to invade Greece. He removed the wax from the tablet and wrote the secret message on the underlying wood and then recovered the tablet with wax to make it appear as a blank tablet and finally sent the document without being detected.

Hiding messages using invisible ink was also very popular. Ancient Romans used to write their secret messages between the blank lines by invisible ink that is generally prepared by fruit juices, milk, and urine etc. When heated, the invisible ink would darken and becomes visible. Ovid in his "Art of Love" suggests using milk to write invisibly. During World War II, it was also reported that the Nazis [3] invented several information hiding methods such as Microdots, and have reused invisible ink and null ciphers. As an example a message was sent by a Nazi spy that read:

"Apparently neutral's protest is thoroughly discounted and ignored. Isman Hard hit. Blockade issue affects pretext for embargo on by-products, ejecting suets and vegetable oils." By collecting the 2nd letter from each word the secret message reveals:

"Perishing sails from NY June 1"

The monk Johannes Trithemius, founders of modern cryptography, described an extensive system for concealing secret messages within innocuous texts in his three volume work Steganographia, written around 1500. Later in 1665 Gaspari Schott wrote a four hundred pages book Steganographica from the idea of Trithemius. Further in 1883, Auguste Kerchoffs' published Cryptographie militaire which is mostly about cryptography. But during twentieth century the information hiding techniques actually came into existence.

III. DISCIPLINES OF INFORMATION HIDING

A wide range of problems beyond the embedding messages in content have been encircled by the general term Information *hiding* (or *data hiding*). The term *hiding* can refer to either for information secrecy (Steganography) or information imperceptibility (Watermarking). Two important sub disciplines of information hiding are Watermarking and Steganography [4] that are closely related to each other but with different underlying properties, requirements and designs, thus result in different

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