ATTACK AND EVALUATION ANALYSIS ON AUDIO WATERMARKING

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I dedicated this thesis to my beloved family for their endless cares and inspirations.

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ABSTRACT

Because of decline in human theft, error, fraud and also misusing the computer properties, the approach of value focused thinking needs to be established. A powerful IS or information system is not able to be developed just according to its technical abilities. This project concentrates on bringing a lot of reliable security system of IS and recognizing the core parts by means of value focused thinking method. Mean and fundamental goals are the outcomes of this method in which the core objectives all have some general usage for decision making in planning of security. The basic objectives have a tight relation with acknowledged aims of the information system security for instance confidentiality and integrity and the mean goals are generally about social challenges for example being responsible for using the sources effectively. In this project, value focused was used in order to develop the current model of the scope. In this regard 6 individual experts were asked to participate and by asking them some questions, fundamental objectives of the organization extracted. Then a new model was presented and this model before being distributed among the staff as a questionnaire was shown to 6 experts and they confirmed it. After their confirmation, this new model was tested by means of questionnaire and the results were analyzed by using the SPSS software.

ABSTRAK

Oleh kerana pengurangan dalam kecurian manusia, kesilapan, penipuan dan juga penyalahgunaan sifat-sifat komputer, pendekatan kepada nilai berfokuskan pemikiran perlu diwujudkan.Sistem maklumat yang kuat tidak dapat dibangunkan hanya mengikut kebolehan teknikal. Projek ini menumpukan kepada membangunkan lebih banyak sistem keselamatan maklumat yang boleh dipercayai dan mengiktiraf bahagian teras melalui kaedah pendekatan kepada nilai berfokuskan pemikiran . Maksud dan matlamat asas adalah hasil kaedah ini di mana semua objektif teras mempunyai beberapa penggunaan umum untuk membuat keputusan dalam perancangan keselamatan. Objektif asas mempunyai hubungan yang rapat dengan mengakui keselamatan sistem maklumat seperti kerahsiaan dan integriti dan maksud matlamat adalah secara umumnya mengenai cabaran sosial contohnya bertanggungjawab dalam menggunakan sumber-sumber dengan berkesan. Di dalam projek ini, pendekatan kepada nilai berfokuskan pemikiran telah digunakan untuk membangunkan skop model semasa. Untuk itu, 6 orang pakar telah diminta untuk mengambil bahagian dan dengan memberi beberapa soalan, kami mencapai objektif asas organisasi. Kemudian model baru telah dibentangkan dan model ini sebelum diedarkan di kalangan kakitangan sebagai soal selidik ianya telah disahkan oleh 6 orang pakar tersebut. Selepas pengesahan mereka, model baru ini telah diuji melalui soal selidik dan keputusan telah dianalisis dengan menggunakan perisian SPSS.

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CHAPTER 1

INTRODUCTION

1.1 Overview

These days most of the people are using the internet to reach so many different purposes, some people are using the internet just to have fun and some other people are dependent to it because of their job for example most of the different publishers distribute their own contents such as text or audio or video through the internet to attract more purchaser and gain more money by having lots of fans from all over the world. But besides all the advantages that a big social network community like the internet has, lots of vulnerabilities, threats and attacks are related to this area too. Creative content providers are always facing to violation of the copyright of their own work especially through the internet and online shopping. The phenomenon of Copyright protection which is an old story is a big concern of digital content providers now a day. There are some methods and ways to protect the authentication and integrity of contents through networks like cryptography, watermarking, digital signature, and other ways.

Embedding some information to provide authentication of the owner of the content for example the singer of a song or the related data about some images that can be visible or invisible called watermarking is an old way to hold intellectual copyright protection and some other aims like “owner identification, proof of ownership, transaction tracking, and copy control” (Cox and Miller 2002). But because there are so many threats in the network a watermark is vulnerable to the alternation or even being removed from the host (the content that the watermark is embedded there) by the attackers, so the necessity of having new methods to make the watermark more robust is obvious. In addition regarding to the audio type content there are numerous attacks that can alter the file and diminish the quality of songs by the way of different types of signal processing. Knowing all types of possible attacks on audio files and analyzing how they can effect on a digital audio content is vital issue that can help the scientist to propose a well method of audio watermarking by considering all the characteristics of a song and the threats related to it.

1.2 Problem Background

Nowadays, the kind of ways being used for access to the contents especially digital audios is unlike from previous decades. People used to buy the songs and albums from the stores and pay directly, but currently they use different devices to connect to the internet and find the new albums and download lots of songs usually without paying money rather than old style shopping. The online shopping and publishing requires more security for the data transmission on the internet, so the need of having security algorithms and methods for distributing data is become more and more important.

During the years of 2000 to 2002 referring to a reporter in LOS ANGELES TIMES, the music industry has served the media unambiguous statistics in terms of piracy, the act of repetition digital music content to a blank CD, or uploading or downloading them through the Internet. Regarding to numerous newspaper articles, a likely 3.6 billion songs are downloaded every month in the United States unlawfully. This tendency of customers sharing their music rather than purchasing it may be attributable to many factors, including the slow economy. Table 1.1 shows the estimation of audio piracy between the years of 1999 to 2002.

Table 1.1: Audio Piracy Estimation(Hall 2002)

Year	Estimation
1999	The music industry estimated that one in four compact discs of new music was actually an unauthorized copy. And since this year, ownership of CD burners has nearly tripled.
By the end of 2001	It was estimated that as many CDs were burned and copied as were bought. 4 In Europe, blank CDs are outselling recorded CDs (although these blank CDs might have also been purchased for legitimate reasons, such as to back-up personal computer files).

In 2009, IFPI (International Federal of the Phonographic Industry) had reported that only five percent of downloaded music is legitimate and the rest had been taken and used illegally with no payment to the owner of the content. Among all these unlawfulness and irregular sharing of contents proof of ownership is a huge concern because everybody who has required knowledge can tamper an audio file and claim that the song belongs to him or her. Audio authentication is significant in content delivery via unreliable channels, for example peer-to-peer (P2P) file sharing. Numerous contrarily encoded versions of the original audio might be existent. Differentiating the legitimate diversity of encodings from malicious tampering is the challenge these days.(Varodayan, Lin et al. 2008)

"Digital audio watermarking has been recognized as a helpful way with dealing with the copyright protection problem in the past decades. Although digital watermarking still faces some challenging difficulties for practical usage, there are no other techniques that are ready to substitute it."(Lu 2005). "We believe that informed watermarking offers significant near-term improvements. While proposed codes for informed embedding are computational efficient they are not robust to volumetric scaling."(Cox and Miller 2002) Later approaches can be extended with cryptographic approaches like digital signatures. To allow different security levels, we have to identify relevant audio features that can be used to determine content manipulations(Steinebach and Dittmann 2003). There is a list of ways that can make an alteration to an audio file in Figure 1.1.

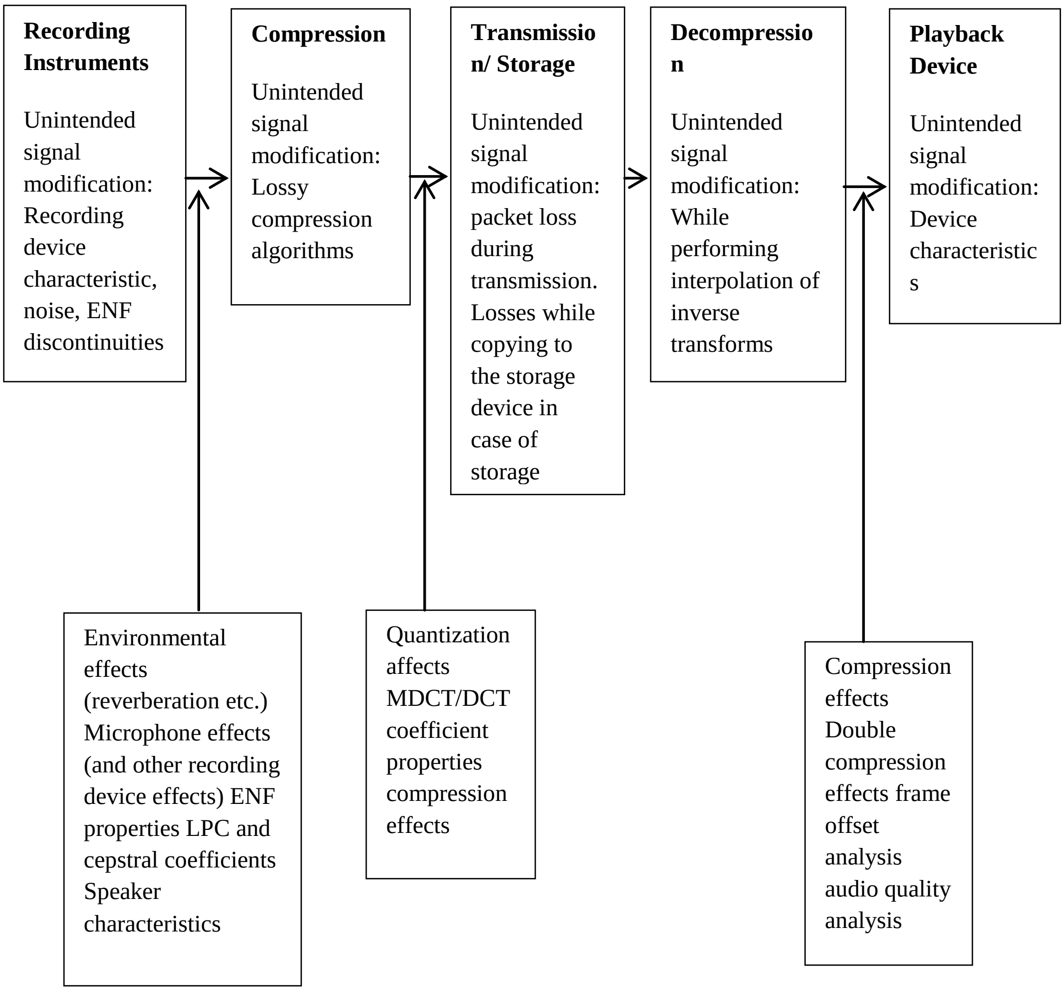
Recording Instruments
Unintended signal modification: Recording device characteristic, noise, ENF discontinuities
Compression
Unintended signal modification: Lossy compression algorithms
Transmission/ Storage
Unintended signal modification: packet loss during transmission. Losses while copying to the storage device in case of storage
Decompression
Unintended signal modification: While performing interpolation of inverse transforms
Playback Device
Unintended signal modification: Device characteristics
Environmental effects (reverberation etc.) Microphone effects (and other recording device effects) ENF properties LPC and cepstral coefficients Speaker characteristics
Quantization affects MDCT/DCT coefficient properties compression effects
Compression effects Double compression effects frame offset analysis audio quality analysis

Figure 1.1 Audio processing system architecture.(Gupta, Cho et al. 2012)

1.3 Problem Statement

Although watermarking technique is a good way to preserve copyright information and it is using for all contents like text, image and video, for audio type contents it is not so public yet. There are a lot of methods proposed by Scientifics to do audio watermarking but the problem is none of them is focusing on a particular genre of music while various genres of music have different characteristics that can effect on the method and needs be tested.

1.4 Purpose of Study

The core drive of this study is to analyze the effects of different types of audio signal processing on audio files and characterize them in particular groups of songs. The major focus is on the effective parameters on evaluation of an audio watermarking method which compare the original audio with the watermarked one to reveal proportion of their similarity.

1.5 Objectives of Study

The subsequent objectives are indicated to accomplish the intent of the study:

i. To study the current watermarking techniques for audio
ii. To analyze the possible signal processing on audio files and observe their effects on the embedded watermark and the audio itself regarding to different genre of music
iii. To correlate tow parameters of audio structure and watermark (size ration and sampling rate) on PSNR

1.6 Significance of Study

This study deliberates a series of useful results from various tests on security and performance measures on a specific audio watermarking method that can be very useful for further studding in this area. The way of analysis is so clear and organized regarding to security and performance dealings.

1.7 Scope of Study

The major focus of this study is copyright issues on audio files and the ways that it can be protected. The boundaries that are covered in this study are representing as follows:

i. The study will discusses on different watermarking methods for audio
ii. The requirements of a high quality audio file which are security , capacity, imperceptibility , robustness , and time consuming are being analyzed
iii. Forty audio file samples would be chosen from four different categories (Rock, Classical, Ambient and Pop) to place the watermark inside
iv. Different types of signal processing (compression, resampling, filtering and delay) would be run on all the audio files
v. Watermark extraction would be done to see whether the watermark can be extracted after attacks successfully or not.
vi. Discussion about different ways of compares the watermarked audio with the original host to measure methods performance
vii. Measuring the selected method performance using PSNR
viii. Correlation between different parameters with PSNR

1.8 Organization of the Report

This study is separated into 6 chapters that so far is introduced and defined concisely the structure of the study would be organized as following statements:

Chapter 1 describes briefly about the overview of the project and understanding of the project problem background then the statement of the problem. It furthermore comprises the project scope, purpose of the study and the objectives. Chapter 2 discusses about the general definition of creative content and copyright issues then focus on the audio file and its characteristics and requirements and introduce the watermarking methods. Beside it has an explanation of different audio signal processing and attacks and the ways to see their exact effects on audio files and watermarks.

Chapter 3 consists of the methodology of this research in details to clarify what exactly would be done in this study and introduce the process of leading this project step by step in three different phases of the framework. Chapter 4 contains explanations of the design and implementation of this study. In this chapter there would be heaps of tables and figures to show the result of various testing.

Chapter explains different methods of comparison between two different audio signals would be introduced and one of them is selected for the further processing of this project. Finally Chapters 6 analyses and abstracts the whole project conclusions and suggests some recommendations.

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