Chapter 28
A Methodological Evaluation of Crypto-Watermarking System for Medical Images

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ABSTRACT

Health care institution demands exchange of medical images of number of patients to sought opinions from different experts. In order to reduce storage and for secure transmission of the medical images, Crypto-Watermarking techniques are adopted. The system is considered to be combinations of encryption technique with watermarking or steganography means adopted for safe transfer of medical images along with embedding of optional medical information. The Digital Watermarking is the process of embedding data to multimedia content. This can be done in spatial as well as frequency domain of the cover image to be transmitted. The robustness against attacks is ensured while embedding the encrypted data into transform domain, the encrypted data can be any secret key for the content recovery or patient record or the image itself. This chapter presents basic aspects of crypto-watermarking technique, as an application. It gives a detailed assessment on different approaches of crypto-watermarking for secure transmission of medical images and elaborates a case study on it.

INTRODUCTION

Crypto-Watermarking is an evident area of research especially with the advent of medical related technologies. Health care institution demands exchange of medical images of number of patients to sought opinions from different experts. In order to facilitate storage and secure transmission of the medical images the applications related to telemedicine, transfer medical images by the aid of efficient crypto-watermarking system (Acharya, R., Bhat, P. S., Kumar, S., & Min, L. C, 2003). Since the transfer of

DOI: 10.4018/978-1-7998-1763-5.ch028

medical imageries between hospitals and additionally among totally different consultants is common occurrence, the security and confidentiality of medical images is demanded. Crypto-watermarking helps in providing the appropriate information embedded in the medical images without creating an opportunity to defame an institution by rightful delivery of medical images to intended owner. The images can be protected while transmitting through channel when encryption is done. After the images get decrypted at the recipient side, it's prone to security breaches which can be protected by the use of watermarking. Thus crypto-watermarking is technique in which cryptography is combined with watermarking. In recent time, Crypto-watermarking techniques are gaining popularity as its finding importance in certain sensitive areas like healthcare, military communication and law-enforcement (Khan, A., Siddiqa, A., Munib, S., & Malik, S. A., 2014).

The utilization of internet for information spreads has created the vital call for security. Numerous robust encryption techniques for plain messages have been industrialized to fund this request. Privacy protection could be ensured with encryption and embedding the symmetric key in the encrypted domain. Encryption is the key for confidentiality and authentication of medical images transmitted. Encryption converts a data into unintelligible form. When an image with some secrecy need to be transmitted is encrypted, the provider unknown of the secret data tries to compress the encrypted image.

BACKGROUND

The Need for Crypto-Watermarking

The need for crypto-watermarking system is to give testimony concerning the security and confidentiality of images especially in sensitive areas like medical and military. In medical field the use of crypto-watermarking comes to play when the security of electronic patient records needs to be guaranteed along with privacy, authenticity and security of respective medical image. The regulations used for checking the protection of these data are the *Health Insurance Portability and Accountability Act (HIPAA)* of US government and the European Data Protection Directive 95/46/EC (Fernández-Alemán, J. L., Señor, I. C., Lozoya, P. Á. O., & Toval, A., 2013).

Crypto-Watermarking system has many applications which include the transfer of images whose security and confidentiality need to be verified also transfer of medical data for patients to undergo proper service regarding the health issues from various specialists. The use of crypto-watermarking in both areas is studied simultaneously in this chapter i.e. secure image transfer having details to preserve and secure electronic patient record transfer along with image. The medical data is protected by the aid of encryption and data hiding algorithms.

Medical field requires the transfer of medical data among practitioners for integrated checkups for patients around the globe. To aid these system EPR facilities for the hospital helps a lot for centralized access of patient records. EPRs give the opening for patients to take improved synchronized care from health providers and admission to their health material becomes easier. Electronic Patient Record (EPR) is a way to make things easier for all and to be better-quality informed and more involved in the patient's general health care. Providing EPRs among the different opinion collectors becomes critical with questions and apprehensions around the confidentiality and security of patient's condition information as well as hospitals fame.

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