

Abstract

In the digital era, the substantial proliferation of open access network and communication technologies has influenced the way information is gathered and processed. This has led to increase in/ increased sharing of multimedia data such as image, audio and video up to significant level & has become widespread practice between the end users. However, this convenience comes with some security and privacy concerns. The issues regarding illegal copying, distribution, duplication, malicious modification and forgery have increased due to the ease of accessing the sophisticated software. Therefore, protection of digital media is one of the major challenge to the information security in today's scenario. This motivates us to develop some standard and robust solution which enhance the overall security of the digital media by preventing these issues. One of the technical solutions is to make it law informants. This can be achieved by some practical solutions like image hashing, encryption and digital watermarking. Image hashing has been widely investigated in an attempt to solve the problems of image content authentication and content-based image retrieval. Moreover, perceptual hashing is advantageous in database search problem. The hashing technique helps to identify and examine the integrity of the data. Encryption is an efficient technique which transforms the original data into cipher data which can be decrypted at the later stage to reproduce the image data. This technique is effectively used to secure the confidentiality of data during the transmission and to protect the content during the storage of the data. Furthermore, digital watermarking is yet another efficient technique addressing the ownership issue for copyright protection. This technique helps to identify the original owner of the media and ensure the legitimate trustworthiness.

The goal of this thesis is to investigate and analyse various aspects in the image security and explore the techniques for image security while ensuring the integrity, confidentiality and trustworthiness of the data. The flourishing image security technologies enable an information shift to the environment characterized by the constraints such as robustness, imperceptibility etc. The fundamental attribute of image security determines the trade-off between robustness and perceptual fidelity, robustness and discrimination. Our research is categorized mainly in the three parts: The first part aims to develop the comprehensive algorithmic framework for identification and authentication of the digital images. This framework provides the digital signature based on some appropriate hash functions to estimate the accurate image similarity. For this purpose, a secure perceptual hash function has been designed for content authentication, for which a new robust reference image hashing system has been proposed. The formal part includes a saliency based visual features detection whereas later one estimates structural features based on a reference image. In addition, a chaos based robust and secure image hashing technique has been developed.

The second part of the research aims to protect the confidentiality of the image data to secure the content of the data using encryption technique. This framework provides the methodology to secure the medical image data during the transmission and storage. This can be achieved by designing a secure image encryption technique for content protection, for which a biometric inspired image encryption scheme has been proposed for medical images. This scheme presents a biometric based key generation to ensure the security. The next part of our research aims to tackle the ownership issue of the multimedia data using a number of copyright protection schemes using digital watermarking techniques. The research problem is addressed by designing a robust watermarking scheme for copyright protection, for which a robust watermarking system in integer

DCT domain has been proposed. This scheme employs a DSR based phenomena to enhance the performance of the system. In addition, a simple watermarking algorithm based on lifting wavelet transform has been developed. This scheme includes the random number generation to signify the efficiency of the proposed scheme. Extensive experimental and comparative analysis have been conducted to validate the efficiency and performance of the proposed solutions for image security.

Several conclusion can be drawn from the thesis. The research shows that data integrity, confidentiality and copyright protection are considered as the important value of image hashing, encryption and watermarking. Therefore, a combined framework of these techniques plays a vital role in image security. Moreover, a systematic development of the technologies can ensure the trustworthiness in a goal oriented approach such as the proposed framework for authentication while complying with relevant legislation. Finally, a number of insight used in the developing framework are provided. Also, future research direction are discussed.