Chapter XXI
Secure Image Archiving Using Novel Digital Watermarking Techniques

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ABSTRACT

With the rapid advance in digital network, digital libraries, and particularly WWW (World Wide Web) services, we can retrieve many kinds of images on personal and mobile computer anytime and anywhere. At the same time, secure image archiving is becoming a major research area because the serious concern is raised about copyright protection and authority identification in digital media. A more sophisticated technique is required for future multimedia copyright protection. In this chapter we propose a secure image archiving using novel digital-watermarking techniques. Firstly, a nonlinear adaptive system (neural network) is applied for frequency-based digital watermarking. Secondly, we discuss application-oriented watermarking method for GIS image archiving. This chapter is divided into two parts. First section is about the way to apply nonlinear adaptive system for frequency-based image watermarking. We propose a new asymmetric technique employing nonlinear adaptive system trained on frequency domain. Our system uses two public keys to prevent removal attack and archive more fragile watermarking. In embedding, location information of frequency domain, where adaptive system is trained, is binalized, expressed in hexadecimal number, and encrypted in asymmetric cryptosystem. Encrypted location information is embedded in several parts of digital host contents. In generating key, supervised neural networks learn to assign the array of coefficients to teacher signal corresponding to the message to insert. This is one kind of transform-based method to generate public key from private key. In extracting, we use key matrix created by one-way signal processing of adaptive system. Proposal

method is tested in still image, and we have empirically obtained the results that the proposal model is functional in implementing more secure and fragile watermarking compared with previous techniques, such as correlation and transform-based asymmetric watermarking. Several experiments are reported to validate the effectiveness of our watermarking method. Second section is about the application of GIS image archiving using digital watermarking technique. Recently, the utilization of GIS (geographical information system) is becoming rapidly pervasive. Consequently, new methodology of archiving and managing images is a pressing problem for GIS users. It is also expected that as the utilization of GIS becomes widely spread, protecting copyright and confidential images will be more important. In this chapter, we propose a three-layer image data format that makes it possible to synthesize two kinds of related images and analysis information in one image data size. To achieve the confidentiality of one hidden image, we apply the private watermarking scheme, where the algorithm is closed to the public. In the proposal model, encoder netlist embedded in the third layer is generated by FOL prover to achieve more secure and less information to decode it, compared with one operation of another block cipher such as RSA. Proposal system users can process two images without the cost of maintaining key and decoding operation.

INTRODUCTION

With the rapid advance in digital network, digital libraries, and particularly WWW (World Wide Web) services, digital watermarking is becoming a major research area because the serious concern is raised about copyright protection and authority identification in digital media. A more sophisticated technique is required for future multimedia copyright protection. Digital multimedia contents on the Internet are easily distributed, reproduced, and manipulated, compared with conventional analog data. In general, a digital watermark is a concealed code embedded into digital multimedia contents irremovably and imperceptibly in order to protect intellectual propriety rights. This chapter presents a new model of processing coefficients using supervised neural network. In our model, neural network is trained to assign coefficients to predefined secret code. Classification method of neural network can deal with predefined data, so it can detect weaker signal and figure out accurate recognition.

Geographical information systems (GIS) is a technological field under rapid progress that combines graphical features and tabular data according to the positions of the earth's surface. The prototype of GIS, which made it possible to program maps and store them on a computer for future modification if necessary, began around 1960. Currently, GIS are represented by several layers for manipulating, analyzing, and displaying for effective planning. The concept of overlaying different mapped features caused the situation that GIS is utilized for handling several maps. Consequently, in the process of GIS, overlaying and derivation are operated. As analysis of geographical images is becoming elaborate and complicated with the improvement of GIS, these bottlenecks are considered for further effective analysis and planning

Problem 1: Cost in managing image data. GIS image is analyzed and processed for a variety of purposes to generate the clipped or derived images. Also, the image is composed from many

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