Chapter 4
Advancement on Damage-Less Watermark Extraction Using Non-Linear Feature Extraction Scheme Trained on Frequency Domain

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ABSTRACT

In this chapter, we propose a new information hiding and extraction scheme for the application in digital watermarking, which does not embed any data to target content, by using non-linear feature extraction scheme trained on frequency domain. This is done by processing the selected coefficients from the selected feature sub-blocks as an input vector to the trained neural network and observing output signal from the neural network. This output signal is used as watermark signal which distinguishes its image from other images. This model trains an artificial neural network to assign predefined secret code for corresponding input feature vector of an image and use this trained artificial neural network weight and the coordinates of the selected feature sub-blocks as a key to extract the predefined secrete code.

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The proposed method contributes to secure image digital watermarking for content identification without damaging or losing any detailed data of visual images. The features of our proposed method employ an application to authenticate multimedia, similarity comparison, verification of image integrity and copyright protection of multimedia contents.

INTRODUCTION

In this chapter, a new model of digital watermarking is proposed, which do not embed any data into the image but are able to extract meaningful data from the image. This is done by processing the coefficients of the selected feature sub blocks to the trained neural network. This model trains artificial neural network to assign predefined secret code and use the artificial neural network weight and the coordinates of the selected feature sub blocks as a key to extract the predefined code. This means that it would not damage the content at all.

Our method consists of three layers for information hiding and retrieval method. First, the proposed method of key generation is to extract certain type of bit patterns in the forms of visual features out of visual objects or data as training data set for machine learning of watermark signal. Second, the proposed method of watermark extraction is processed by presenting visual features of the target visual image into extraction key or herein is a classifier generated in advance by the training approach of machine learning technology. Third, the training approach is to generate the extraction key which is conditioned to generate watermark signal patterns only if proper visual features are presented to the classifier. In our proposed method, this classifier which is generated by the machine learning process is used as watermark extraction key. The discussed watermark extraction key and feature extraction key identify the related or associated hidden bit patterns which is the watermark signal values for proper digital watermark embedding and extraction procedure as shown in Figure 1 and 2.

The proposed method is to hide or relate bit patterns of visual information as training data set for machine learning and to generate classifiers as watermark extraction key. These hidden bit patterns are prepared in advance to the training of classifiers which will eventually generates the associated visual information as watermark signals. This trained classifier acts as watermark extraction key. The feature extraction keys generate the feature values necessary for generation of watermark extraction keys. The feature extraction keys contain visual information including feature coordinates and regions of frequency coefficients. Machine learning also generates classifiers as watermark extraction keys. The discussed watermark extraction key and feature extraction key identify the secure and unique hidden bit