Chapter 6

Secure Key Generation for Static Visual Watermarking by Machine Learning in Intelligent Systems and Services

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ABSTRACT

The Service-Oriented Architecture (SOA) demands supportive technologies and new requirements for mobile collaboration across multiple platforms. One of its representative solutions is intelligent information security of enterprise resources for collaboration systems and services. Digital watermarking became a key technology for protecting copyrights. In this article, the authors propose a method of key generation scheme for static visual digital watermarking by using machine learning technology, neural network as its exemplary approach for machine learning method. The proposed method is to provide intelligent mobile collaboration with secure data transactions using machine learning approaches, herein neural network approach as an exemplary technology. 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 digital watermark. 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 the proposed method, this

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INTRODUCTION

In this article, we propose a method of key generation scheme (Figure 1) for static visual digital watermarking (Figure 2) by using machine learning technology, neural network as its exemplary approach for machine learning method.

The proposed method is to provide intelligent mobile collaboration with secure data transactions using machine learning approaches, herein neural network approach as an exemplary technology. 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 digital watermark. 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 proposed method is to contribute to secure visual digital watermarking without losing any detailed data of visual objects or any additional resources of hiding visual objects as molds to embed hidden visual objects. The proposed method has used neural network for its training approach not limited but open in its applications to other machine learning approaches including fuzzy, Bayesian network and others. In this article, the target content is a static visual data which are constructed with discrete data set and we have demonstrated the feasibility of solving this problem by using neural network model. We would enhance our method by using those other approaches, such as fuzzy for dynamic visual data like video stream data and Bayesian network for continuous data structures. This article is different from the previous work by Ando et al. (Ando, R. & Takefuji, Y., 2003) in terms of embedding size where this article does not embed any information to the target content and also implies that the machine learning algorithm is not limited only to the neural network model as proposed in our previous work (Naoe, K. & Takefuji, Y., 2008).

ISSUES AND DEFINITIONS

The Service-Oriented Architecture (SOA) demands supportive technologies and new requirements for mobile collaboration across multiple platforms. One of its representative solutions is intelligent information security of enterprise resources for collaboration systems and services (Chiu, & Leung, 2005; Kafeza, Chiu, Cheung, & Kafeza, 2004).

Digital watermarking became a key technology for protecting copyrights. Digital watermarking protects unauthorized change of the contents and assures legal user for its copyright. Meanwhile, steganography conceals a hidden messages to a content but the existence of a message is kept secret (Artz, 2001). For the purpose of digital watermarking, content should not be encrypted or scrambled. Digital watermark is often embed-
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