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Robust watermarking scheme for color image based on quaternion-type moment invariants and visual cryptography

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Abstract

This paper introduces a novel robust watermarking scheme for copyright protection of color image based on quaternion-type moment invariants and visual cryptography. As a secure way to allow secret sharing of images, visual cryptography realizes encryption of classified information and the decryption is performed through human visual system. The proposed scheme represents the color image into a quaternion matrix, so that it can deal with the multichannel information in a holistic way. Then the quaternion moments are applied to extract the invariant features, which are crucial to generate the master share. Together with the scrambled watermark, they are used for constructing the ownership share based on visual cryptography. Afterwards, the ownership share is registered and responsible for authentication. A set of experiments has been conducted to illustrate the validity and feasibility of the proposed scheme as well as better robustness against different attacks.

Keywords: Color image, copyright protection, watermarking, quaternion moment invariants, visual cryptography

1. Introduction

With the convenient accessibility of digital multimedia products, enormous amount of digital images are daily generated and propagated over different kinds of communication channels. Under such scenario, the authentication of multimedia data becomes an important concern.

As a promising mechanism, digital watermarking has being one of research topics since its concept was put forward [1] and gained prosperous development in the past two decades [2-8]. For example, Wu and Sun [2] designed a discrete cosine transform (DCT) and singular value decomposition (SVD) based copyright protection scheme. Gao and Jiang [3] used the magnitudes of the Bessel-Fourier moments as feature descriptors to construct a zero-watermark scheme. However, their schemes require a normalization procedure to resist geometric distortions. Khan et al. [4] provided a comprehensive survey on reversible watermarking algorithms reported lately. Nyeem et al. [5] constructed a formal generic watermarking model and discussed a set of watermarking properties as well as possible attacks. Since the quaternion representation can deal with a color image in a holistic way,

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