

Chapter 14

Enhancing the Binary Watermark–Based Data Hiding Scheme Using an Interpolation– Based Approach for Optical Remote Sensing Images

Mohammad Reza Khosravi
Shiraz University of Technology, Iran

Habib Rostami
Persian Gulf University, Iran

Sadegh Samadi
Shiraz University of Technology, Iran

ABSTRACT

Computer networking and internet developments create new challenges in information security and copyright protection. In order to protect the multimedia data and also in some cases, for information management, the authors can use watermarking schemes to achieve more security. In this article, the authors firstly review a watermarking scheme for remote sensing applications, represented by Zhu et al.; They also explain two problems in Zhu et al.'s scheme and in addition, introduce two solutions for these problems. Generally, Zhu et al.'s scheme is a non-blind scheme that also does not have any attention to watermarked image quality, thus they try to represent ways in order to achieve the blind and quality-aware watermarking. Experimental results confirm that both of their modifications have suitable effectiveness than the original scheme whereas in practice, their modifications create an output with embedding capacity like the original scheme but it is high quality and also blind.

DOI: 10.4018/978-1-5225-7033-2.ch014

INTRODUCTION

Nowadays, communication networks and multimedia technologies are pervasively used for exchanging electronic files in which these networks and related technologies are some hot topics for research. Due to the rapid advances of computer networking technology, it increasingly becomes common in order to use in data transmission channel (Liu et al., 2015; Wang, 2013; Khosravi et al., 2015a; Khosravi et al., 2017a), for broadcasting platforms of information and sharing data in terms of publicly easy copying of digital data (Cao & Huang, 2012). All these factors have helped to improve quality of information services, however the factors are also against data security and content management at the same time because of existing big data in the networks (Singh & Sinha, 2010). In addition, the digital watermarking technology as an effective technology for data hiding has been studied and applied for applications such as image, audio and video transmission (Luo et al., 2011; Salari & Rostami, 2016). As an application, the digital watermarking technology for remote sensing data is a good solution which can solve management issues of these remote sensing images because these images have many details and information in which these details can be embedded in an original image. Therefore, digital watermarking is an effective hiding method in order to obtain the mentioned aims.

A main field in remote sensing data processing is satellite data management. In order to this management, some watermarking algorithms for only the remote sensing images have recently been proposed. In (Fang et al., 2014), a robust reversible data hiding technique for multispectral images has been proposed. Data bits can be effectively carried by the 3D-IWT blocks in the proposed technique. In (Chen et al., 2010), the authors have proposed a DCT-based robust and blind watermarking algorithm by considering the basic characteristics of common manipulations in remote sensing images. In (Serra-Ruiz & Megias, 2010), a semi-fragile watermarking method for remote sensing images based on TSVQ and DWT is presented. This method uses the information in a set of spectral bands simultaneously. All recent three methods use the operators of frequency domain whereas many of remote sensing images have many edge pixels in all of image regions which allow us to use simpler spatial domain operators. In order to have a low complexity, we use spatial domain processing in our work. Some other papers like (Jiang et al., 2013) have worked on joint encryption/watermarking process on which the authors proposed to integrate encryption and watermarking based on an orthogonal decomposition for comprehensive security protection of remote sensing images. In the basic work of our study (Zhu et al., 2013), a watermarking technique has been proposed in order to apply in satellite images. This scheme is a non-blind watermarking based on a spatial domain operator for copyright protection. We are going to improve this technique in terms of quality in here. Importance of our work is to attend to the quality of watermarked images which has not been considered in the basic work. In this technical problem, i.e. data hiding of remote sensing images for management issues, the quality must be preferred than robustness because the robustness or security is a secondary aim in managing remote sensing data. We change the structure of embedding process of the basic technique with using operators of spatial domain. Our changes can debilitate the final approach in terms of robustness but it is not bad because we must firstly improve the process in terms of quality, and then introduce some ways for creating robustness (see future work part in final section). The rest of the paper is organized as follows. In second section, we present a brief survey on the Zhu et al.'s watermarking method. Third section firstly discusses about Zhu et al.'s watermarking method and then, the proposed scheme is represented. Experimental results are reported in forth section. Conclusions and future work are drawn in final section.

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