Accepted Manuscript

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PII: S1047-3203(17)30193-1
DOI: https://doi.org/10.1016/j.jvcir.2017.10.001
Reference: YJVCI 2068

To appear in: *J. Vis. Commun. Image R.*

Received Date: 13 April 2017
Revised Date: 2 August 2017
Accepted Date: 4 October 2017

Please cite this article as: W. He, K. Zhou, J. Cai, L. Wang, G. Xiong, Reversible data hiding using multi-pass pixel value ordering and prediction-error expansion, *J. Vis. Commun. Image R.* (2017), doi: https://doi.org/10.1016/j.jvcir.2017.10.001

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Reversible data hiding using multi-pass pixel value ordering and prediction-error expansion

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Abstract

Pixel value ordering (PVO) prediction has become the most efficient method for high-fidelity reversible data hiding (RDH). In this approach, only the maximum and minimum of pixel block are predicted and modified to embed data and the preservation of pixel value order guarantees the reversibility. To achieve larger embedding capacity and superior performance, more blocks suitable for RDH are utilized in recent improved schemes. However, their performance is still unsatisfactory. In this paper, a novel RDH scheme is proposed by extending original PVO into multi-pass PVO embedding. Specially, the k largest or smallest pixels are taken as independent data bit carriers to fulfill k-pass PVO embedding. Although the pixel value order may change after data embedding, reversibility still can be guaranteed and image redundancy can be far better exploited. Moreover, embedding performance can be further enhanced by optimal combined embedding. Experimental results verify that the proposed scheme outperforms previous PVO-based schemes and some other state-of-the-art works.

Keywords: Reversible data hiding, multi-pass pixel value ordering, prediction-error expansion, optimal combined embedding

1. Introduction

Data hiding [1] can be used in various applications such as copyright protection and authentication by embedding secret message into the host

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