图形、图像、模式识别

基于Hilbert扫描和SVD的小波域图像水印算法

宋颖祥，丁宣浩，徐安农

桂林电子科技大学 数学与计算科学学院，广西 桂林 541004

摘要 为了提高水印的安全性、鲁棒性和不可见性，提出了一种基于Hilbert扫描和SVD（Singular Value Decomposition，奇异值分解）的小波域图像水印技术。算法以一幅有意义的二值水印图像为水印信号。首先对原始图像进行一层小波变换，对低频分量进行图像分块，并对每一个图像块进行SVD。利用了SVD的单向非对称性和正交矩阵的性质，给出了一种自适应水印方案。同时，利用了Hilbert扫描能很好地保持图像空间局部连接性的特点。然后，利用图像的局部统计特征自适应地修改阈值，利用两个阈值严格控制系数的修改程度，使算法达到不可见性和鲁棒性之间的最优平衡。水印的提取无需原始图像的参与，达到了真正的盲水印。实验结果表明，该算法是有效的，对常见的图像处理操作具有较强的鲁棒性。

关键词 数字水印 Hilbert扫描 小波域 奇异值分解（SVD）

分类号 TP309

Adaptive image watermarking algorithm based on Hilbert scanning and wavelet domain SVD

SONG Ying-xiang，DING Xuan-hao，XU An-nong

School of Mathematics and Computational Science，Guilin University of Electronic Technology，Guilin，Guangxi 541004，China

Abstract

In order to improve the security，robustness and invisibility of a watermark，an image watermarking technology is proposed，based on the wavelet domain singular value decomposition and Hilbert scanning.The watermark signal is a binary watermark image.First，do a wavelet transform to the original image，then block to the low-frequency components，and for all image blocks do singular value decomposition.SVD preserves both one-way and non-symmetric properties.According the characters of the orthogonal matrix after SVD，an adaptive image watermarking scheme is given by taking full advantage of Hilbert scanning.The threshold，which is used to modify the selected coefficients，is decided by the statistical properties of local blocks.The modification of coefficients is controlled by these two thresholds so as to obtain the optimal tradeoff between the invisibility and the robustness.At the same time，the watermark can be extracted without original image.It is truly blind watermark algorithm.The experimental results show that the proposed algorithm is effective，which is very robust to common image processing operations.

Key words Digital Watermark Hilbert Scanning Wavelet Domain Singular Value Decomposition（SVD）

通讯作者 宋颖祥 yx_song@126.com

扩展功能

本文信息

- Supporting info
- PDF(797KB)
- [HTML全文](0KB)
- 参考文献

服务与反馈

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- 复制索引
- Email Alert
- 文章反馈
- 浏览反馈信息

相关信息

- 本刊中 包含"数字水印"的相关文章

本文作者相关文章

- 宋颖祥
- 丁宣浩
- 徐安农