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光通信与光信息技术

基于全变差重构算法的数字全息研究

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摘要： 为了消除传统算法对数字全息重构过程中会出现0级像、共轭像干扰的问题，将压缩感知理论与数字全息图再现相结合，提出了基于全变差的两步迭代收缩阈值重构算法（TwIST），并应用于数字全息图压缩感知全息图重建。 TwIST算法根据重构成分的特点增加正则约束，对相应的形态进行调整，在满足全变差最小的特性的基础上进行重构，提高了重构全息图的质量。结果表明，TwIST算法可以对数字全息图稀疏重建，利用35%的部分全息图数据进行图像重构，重构图像峰值信噪比为36.46dB，且没有0级像和共轭像等干扰。该研究结果对实现计算全息的实时性具有重要的意义。

关键词： 全息 压缩感知 计算全息 数字全息图 全变差重构算法

Study on digital holography based on the total variation reconstruction algorithm

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Abstract: In order to eliminate the zero-order image and the conjugate image interference problems in the traditional algorithm for reconstruction of digital hologram, a new algorithm based on the total variation of the two-step iterative shrinkage thresholding (TwIST) was proposed combining compressive sensing theory

with reconstruction of the digital hologram. According to the characteristics of the reconstruction component, the TwIST algorithm based on the total variation improves the quality of the reconstruction of hologram. The simulation results show that the hologram can be reconstructed from a sparse hologram with TwIST reconstruction algorithm a high quality image was reconstructed from 35% of a hologram and the peak signal-to-noise ratio (PSNR) of the reconstructed image was 36.46dB without zero-order image and conjugate image interference. The study is helpful for implementing real-time computer-generated hologram.

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