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SUN YAT-SEN UNIVERSITY

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学生姓名
Student Name：吴茼

学号
Student No：17307053

指导教师（职称）
Supervisor(Title)：李嘉（副教授）

时间：二零二二年四月十一日
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层叠成像中的相位恢复问题

摘要

本文主要讨论偏相干层叠成像中的相位恢复问题。根据被偏向干效应污染的无相位的衍射图序列，恢复出真实图像和用于成像的探针。为了刻画偏向干效应，选用了多种物理模型中的一个，并详细讨论了它与一般化的多模态模型间的关系。将直观的交替投影方法改进为 ADMM 算法，并拓展到多个模态的情形。我们进行了三个仿真数值实验验证了算法的有效性。第一，模态逼近实验。随着模态数目增加，逼近密度矩阵的精度提高，图像的恢复质量提升。算法恢复出来的模态与根据模型产生的标准答案高度相似。第二，尝试在 ADMM 中加入正交化约束，避免搜索过程中不同模态的信息重叠，提升算法的效率。第三，有噪声的情形。

关键词：相位恢复　偏向干理论　层叠成像　ADMM

Partially coherent ptychography

Abstract This paper mainly discusses the phase recovery in partially coherent ptychography. The real image and the probe are recovered from the phase-free diffraction pattern sequence contaminated by the partially coherent effect. To characterize this effect, a 'phobe vibration' model is chosen and its relationship to a generalized model is discussed in detail. The alternative projection method is improved to an ADMM algorithm and extended to the case of multiple modes. We conducted three numerical experiments to verify the effectiveness of the algorithm. First, approximation by the modes. As the number of modes increases, the accuracy of approximating the density matrix increases, and the quality of the recovered image improves. The modes recovered by the algorithm are highly similar to the standard answer generated from the model. Second, try to add orthogonalization constraints in ADMM to avoid redundant information of different modes in the searching process. Third, noisy case.

Key words: Phase retrieval Coherence theory Ptychography ADMM

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