

理论研究

控制三维光场的纯相位衍射光学元件优化设计

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摘要 为提高纯相位衍射光学元件的设计效果, 实现高衍射效率的三维光场衍射传播控制, 在原有GS迭代算法的基础上提出了新的相位加权迭代优化设计算法。此算法的特点是, 建立多衍射输出平面迭代加权算法模型, 并通过反馈各个设计输出平面在迭代计算过程中的设计误差, 引入一定的相位动态加权整调策略, 以达到更加优化的设计效果。以此算法设计一个纯相位衍射光学元件, 将输入的高斯光束在距离输入面300mm~400mm内的每个平面上变换为 2×2 等强度光束阵列。通过对比实验发现此方法在原有算法基础上能进一步改善算法的收敛效果, 提高整体设计质量, 实现更加优化的运算。

关键词 [衍射光学器件](#) [光场传播](#) [GS算法](#) [纯相位光学元件](#) [三维空间](#)

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Optimization design of phase-only diffractive optical element for controlling the light propagation in 3-D space

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Abstract In order to control the light propagation with high diffraction efficiency in 3-D space, a new phase weighted iterative optimum algorithm based on GS iterative algorithm is proposed to improve 3-D phase-only diffractive optical element (DOE) design. A weighted iterative algorithm model based on multi-diffractive output planes was established. In this algorithm, a dynamic phase weighted adjustment strategy based on the feedback of design error on each output plane is performed to optimize the conventional algorithm. A designing experiment was carried out to validate the effect of this algorithm. In this designing experiment, a phase-only diffractive element was designed to transfer the incident Gauss beam into 2×2 beam arrays in every plane, which occurred at 300mm ~ 400mm to the incident plane. It is found that this method can improve the convergent effect of the algorithm on the basis of the previous algorithm and achieve the better design quality.

Key words [diffractive optical element \(DOE\)](#) [light propagation](#) [GS algorithm](#) [phase-only optical element](#) [three-dimensional space](#)

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