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器件物理及器件制备技术

用于集成成像的针孔/微透镜组合阵列设计与仿真

周雄图, 陈恩果, 姚剑敏, 徐胜, 曾祥耀, 林金堂, 张永爱, 郭太良

福州大学 物理与信息工程学院, 福建 福州 350002

**摘要:** 集成成像3D显示是一种利用微透镜阵列进行三维信息记录和重现的技术, 针对集成成像3D显示过程中, 微透镜之间间隙导致的杂散光引起干扰以及微透镜所成像之间的串扰导致的重构图像质量下降原因, 采用针孔阵列的不透光部分来屏蔽杂散光, 构建了针孔/微透镜组合阵列结构。根据集成成像原理, 分析针孔/微透镜组合阵列的参数, 并利用Tracepro光学软件对集成成像3D显示过程进行仿真, 结果显示: 在记录和重构阶段, 针孔/微透镜组合阵列都能有效减少通过微透镜之间间隙的杂散光引起的与成像无关的亮斑, 提高图像显示质量; 当记录阶段和重构阶段均采用针孔/微透镜组合阵列时, 得到的重构图像质量最好。

**关键词:** 光学设计 集成成像3D显示 针孔阵列 微透镜阵列

## Design and Simulation of Combined Pinholes/Microlens Array for Integral Imaging

ZHOU Xiong-tu, CHEN En-guo, YAO Jian-min, XU Sheng, ZENG Xiang-yao, LIN Jin-tang, ZHANG Yong-ai, GUO Tai-liang

College of Physics and Information Engineering, Fuzhou University, Fuzhou 350002, China

**Abstract:** Integral imaging is a display technology which captures and displays three-dimensional (3D) information using microlens array, stray light from the intervals between the elemental lens and crosstalk between the elemental images might affect the quality of the reconstructed image. This paper presents a combined pinholes/microlens array, in which the pinholes array was used to reduce the stray light. The parameters were designed and analyzed according to the principle of integral imaging, and the 3D display process was simulated using Tracepro. The results show that the presence of pinholes array reduces remarkably the light spots irrelevant to the imaging during both the pickup and reconstruction of images. Especially, when the pickup lens and reconstructed lens were both pinholes/microlens array, the reconstructed image with the highest quality was obtained.

**Keywords:** optical design integral imaging 3D display pinholes array microlens array

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通讯作者: 郭太良, gtl\_fzu@hotmail.com

作者简介: 周雄图(1982-), 男, 福建晋江人, 博士, 讲师, 主要从事光电显示技术的研究。

作者Email: gtl\_fzu@hotmail.com

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