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现代应用光学

激光投影显示中静态复合散斑的表征与建模

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摘要: 对激光投影显示系统中形成散斑的光学系统进行了简化。采用理论与实验相结合的方式, 用简化的光学系统分析了复合散斑的形成机理和有效表征方法。基于散斑对比度分析法, 对影响复合散斑对比度的4个重要因素, 即入射光束的光斑直径, 散射片与屏幕之间的距离, 屏幕上粗糙散斑颗粒和屏幕表面的精细散斑颗粒进行了系统实验分析, 并通过实验数据确定了这些因素与复合散斑对比度的函数关系。基于统计分析, 研究了复合散斑的构成成份, 提出了粗糙散斑颗粒与精细散斑颗粒对复合散斑的贡献模型, 并通过实验验证了其可行性。实验结果为有效抑制激光投影显示中的复合散斑提供了实验依据。

关键词: 激光投影 激光显示 激光散斑 复合散斑 散斑表征

Characterization and modeling of static compound speckle in laser projection display

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Abstract: The optical system which produces speckles in a laser projection display system was simplified. By combining theories and practices, the simplified system was used to analyze the formation mechanism of a compound speckle and its effective characterization. Based on the speckle contrast analysis method, four important factors affecting the contrast of the compound speckles were analyzed by the experiments, namely, the spot diameter of an incident light beam, the distance between diffuser and screen, the coarse speckle granule on the screen and the fine speckle granule above the screen. Then, the contrasts of the compound speckles as a function of these parameters were determined by the experimental data. After researching the constitute of the compound speckle, a relational model based on contribution of the coarse granule and the fine granule on the compound speckle was presented by statistical analysis method and confirmed by an experiment. Obtained results provide an effective experimental basis for the speckle suppression in the laser projection display.

Keywords: Laser projection Laser display laser speckle compound speckle speckle characterization

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