

论文

TIR透镜优化设计在LED微投影显示系统中的应用

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摘要:

发光二极管 (lighting emitting diode, LED) 取代传统光源作为投影仪, 特别是微投影显示系统的光源是一种趋势。采用由非球面构成的TIR透镜代替锥形光管和CPC集光器, 并通过整个系统最终在目标屏上形成的照明效果为依据, 对TIR透镜的内部结构尺寸参数进行优化设计, 采用经过优化设计的TIR 透镜作为对LED光源所发光束进行收集整形的光学元件, 克服了在传统投影显示系统中经常出现的锥形光管或复合抛物面集光器 (compound parabolic concentrator, CPC) 给整个系统所带来的光学体积大的缺点。以单片式LCOS (liquid crystal on silicon) 结构为基础, 利用RGB LED时序方式进行混色, 设计了一套LED微投影显示系统, 并通过光线追迹程序对其光学性能进行模拟评估。结果表明: 在考虑时序混色方式影响的情况下, 整体系统光能效率为2.38%, 系统光学体积仅为125cm³, 达到了对系统结构简单紧凑的设计要求。

关键词: TIR透镜;光二极管;化设计;照均匀度;光效率

Application of TIR lens optimization design in LED micro-projector

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Abstract:

With the development of LED technology, the trend that LED supersedes traditional lamp as the dominant light source for projectors is gradually obvious, especially for micro-projector. The TIR lens optimized in design are adopted to collect and transform the light from LED to overcome the disadvantage of big volume of an optical system using the tapered light pipe or CPC in traditional projection system. A time-sequence illumination system is designed to take RGB LED as its light source and single LCOS panel as the basic structure. Considering the effect of the time-sequence illumination way, the optical performance was evaluated by the ray tracing simulation program. The result shows the luminous efficiency of the entire system is 2.38%, the volume of the entire system is 125cm³, and the compact structure meets the requirement of illuminators.

Keywords: TIR lens; LED; optimization design; illumination uniformity; luminous efficiency

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参考文献:

[1] 范朝勋.LED投影发展和趋势述评 [J]. 现代显示, 2006, 70(12):6-7
 FAN Chao-xun. Reviewing development and tendency of LED-based projection [J]. Advanced Display, 2006, 70(12):6-7. (in Chinese with an English abstract)

[2] 吴宝宁,李宏光, 俞兵,等. LED 光学参数测试方法研究 [J]. 应用光学,2007,28(4):513-516.
 WU Bao-ning, LI Hong-guang, YU Bing,et al. Measurement of optical parameters for LEDs [J]. Journal of Applied Optics, 2007,28(4):513-516. (in Chinese with an English abstract)

[3] MURAT H, CUYPERS D, DE SMET H. Design of new collection systems for multi LED light engines [J]. SPIE, 2006,6196:619604.1-619604.11.

[4] KRIJN M P C, SALTERS B A, WILLEMSSEN O H. LED-based mini-projectors [J]. SPIE,

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2006,6196:619602.1-619602.14.

[5] PARKYN W A, PELKA D G. New TIR lens applications for light emitting diodes [J] . SPIE, 1997,3139:135-140.

[6] BORTZ J C, SHATZ N E, PITOU D. Optimal design of a nonimaging projection lens for use with an LED source and a rectangular target [J] . SPIE, 2000,4092:130-138.

[7] BORTZ J, SHATZ N. Optimal design of a nonimaging tir doublet lens illumination system using a led source [J] . SPIE, 2004,5529:8-16.

[8] 陈国良, 王煦法, 庄镇泉,等. 遗传算法及其应用 [M] .北京: 人民邮电出版社, 1996.

CHEN Guo-liang, WANG Xu-fa, ZHUANG Zhen-quan,et al. Genetic algorithm and its application [M] . Beijing: Post & Telecom Press, 1996. (in Chinese)

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