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论文

一种新的基于空间图案信号的多进制无线光通信技术

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摘要：

提出了一种新的多进制无线光通信技术, 其基本原理是用一组相互易区分的空间图案代替传统无线通信中的会聚光斑传递信息. 分析了该通信方案的信道容量, 结果表明无线光通信系统存在未被利用的空间自由度, 其大小与系统收发孔径和光波波长有关, 与光场空间分布无关. 通过合理设置系统的结构参数和设计信号图案, 可以利用无线光通信系统的空间自由度增加信道容量. 提出了一种实现该技术的光电系统方案, 其关键组成部分为空间光调制器和图象相关器. 详细描述了信号处理过程, 具体包括二维相关处理、比较判决和进制转换三部分. 分析了该方案的误码性能, 得到了平均误码率的估算公式, 分析得到了可降低误码率的信号设计基本规则. 最后用一个透镜阵列处理器通过实验验证了该通信方案.

关键词： 无线光通信 空间图案 空间自由度 多进制

Potential Multi-ary Wireless Optical Communication Technology Based on Spatial Pattern Signal

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Abstract:

A novel multi-ary wireless optical communication technique is proposed, which utilizes a set of mutually distinguishable spatial patterns instead of convergent facula to transmit information.The communication capacity of the proposed communication scheme is analyzed.The results show that the spatial freedom of the wireless optical communication system can be utilized to increase the communication capacity highly by reasonably selecting parameters of the system geometry and designing signal patterns.A typical electro-optical system scheme of the proposed communication is presented.The signal processing scheme is described in detail, which includes the following three processes as 2D correlation, comparison and M/2 conversion.The error performance of the proposed communication scheme is analyzed and the average probability of error decision is obtained.For reducing error decision, the fundamental rules of designing spatial pattern signal are formulated.Finally, the proposed communication is experimentally demonstrated with a lenslet array processor.

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