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光通信与光信息技术

LDPC在gamma-gamma信道下的性能分析

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摘要： 为了提高无线光通信系统的性能,将低密度奇偶校验码作为信道编码,在已知信道状态信息的条件下,对低密度奇偶校验码(LDPC)+二进制脉冲位置调制(BPPM)系统与LDPC+开关键控(OOK)系统分别在加性高斯白噪声(AWGN)、弱湍流、中等湍流和强湍流信道中的性能进行了比较;仿真了OOK和BPPM在各个强度湍流信道下的编码增益;并对LDPC结合不同进制数的脉冲位置调制(PPM)进行了分析。结果表明,LDPC+BPPM的性能优于LDPC+OOK,且随着湍流强度的增大,前者的优势则更加明显;OOK和BPPM在AWGN、弱湍流和中等湍流信道中,编码增益都随着湍流强度的增大而增大,不同的是,OOK在中等湍流中比强湍流中的大,而BPPM则在中等湍流中的比强湍流中的小;LDPC+PPM时,从4PPM到256PPM,PPM的进制数每翻1倍,系统都有约1dB的损失。因此,在湍流信道条件下,LDPC+PPM具有较大的编码增益,且实现的复杂度较低,在无线光通信中将有一定的应用前景。

关键词： 光通信 低密度奇偶校验码 调制方式 gamma-gamma湍流信道

Performance analysis of LDPC codes in the gamma-gamma channel

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Abstract: In order to improve the performance of wireless optical communication, the low density parity check (LDPC) code is used for the channel coding. When the channel state information is known, the performance of system LDPC+binary pulse position modulation(BPPM) and system LDPC+on-off keying(OOK) was compared respectively in additive white Gaussian noise(AWGN), weak, medium and strong turbulence channels. The result shows that the performance of LDPC+BPPM is better than that of LDPC+OOK, and with the increase of the turbulence intensity, the advantage of LDPC+BPPM becomes more apparent. The coding gain of OOK and BPPM was studied in various strength turbulence channels, both of the BPPM's and OOK's in AWGN, weak and medium turbulence channel, increase with the increase of the turbulence intensity. The difference is OOK coding gain in medium turbulence channel is bigger than that in strong turbulence, However, BPPM coding gain and OOK's are opposite. When coding, from 4PPM to 256PPM, when the number of binary is doubled, there is about 1dB loss than the original system. Therefore, system LDPC+PPM has a large coding gain in turbulence channel, and low complexity, and a certain application prospect in optical wireless communication.

Keywords: optical communication low density parity check code modulation scheme gamma-gamma turbulence channel

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