



请输入检索词: 论文名称 智能扩展

[<<上一记录](#) [下一记录>>](#)

ID 2110302005370004 [公开]

论文名称	移动通信中新型非对称喷泉编码调制设计与性能分析/Novel Asymmetric Fountain-coded Modulation Design and Performance Analysis in Mobile Communications
作者	张小弟 <>
学位	博士
答辩日期	2012.05.22
正导师	樊平毅
副导师	
培养单位	清华大学. 023 电子系. 电机工程.
研究方向	
中文关键词	喷泉码,LT码,非对称调制映射,移动通信,编码模块设计
英文关键词	fountain codes, LT codes, asymmetric modulation mapping, mobile communication, encoding module design
论文总页码	共97页
馆藏号	

中文摘要

随着无线通信，特别是移动通信的快速发展，人们使用智能手机的数目及机会日渐增多。人们对于通讯的要求已不限于语音方面，而对数据传输的应用有了更大的需求，使得宽带通信成为下一代通信技术发展的主流。无线通信，尤其是移动通信，其传输信道具有很强的时变特征，同时也时常伴有多普勒效应，这为高速移动通信带来新的挑战。针对无线通信的固有特点和存在的一些技术难点，数字喷泉编码有可能成为一种新的支撑技术，这是因为其无限速率编码的特点，不论信道删除状况如何恶劣，只要接收端能正确接收足够多数量的编码数据包，便能成功实现解码。这种特点可以适合多种应用场景，而不受环境的影响。针对数字喷泉编码的所有编码数据包具有几乎相同重要性的特点，本文以提高频谱使用率为目标，提出了一种适用于高速移动通信场景中的新型混合非对称喷泉映射策略，它除了改善频谱使用率外，另一方面，亦希望此创新的设计能尽量地使用所有具有负载可用信息的接收数据包，其混合分组调制方式具有比传统BPSK及QPSK调制方式更加优越的性能。首先，本文将对数字喷泉编码，包括LT码及Raptor码等子类型进行简单的介绍。第二，对于数字喷泉码的编码模块的设计原理进行分析与改进，主要体现在如下两个方面：1) 在分析数字喷泉编码的编码原理基础上，研究伪随机产生器对数字喷泉编码的影响；2) 在分析有限域LT码的原理基础上，提出一种新的有限域LT码的节点度分布函数，仿真结果表明该函数适用于高编码域的LT码，与常用的节点度分布函数相比，具有更好的性能。第三，根据数字喷泉码的编码数据包具有近似重要性的特点，提出了一种新型的混合BPSK/QPSK非对称喷泉映射策略，它不仅能够改善频谱使用率，其混合分组调制方式，经理论及仿真结果证明，能具有比传统BPSK及QPSK调制方式具有更好的性能。第四，由

于移动通信的应用日渐增多，本论文也对新型的混合非对称喷泉映射策略应用于高速移动通信场景中，尤其是受到多普勒效应影响时的性能进行了分析和讨论。具体方法是，首先探讨典型LT码在多普勒效应下的性能，然后再探讨混合非对称喷泉映射策略在多普勒效应下的性能。仿真结果显示，本文提出的混合非对称喷泉映射策略对剩余多普勒参差具有良好的鲁棒性。

外文摘要

As wireless communication, especially mobile communication, technologies are being developed rapidly, people have much more number of mobile phones and chances for using them. Their communication needs are generally not restricted only for the voice communication, but also for the data communication. Therefore, wideband wireless communications become the main stream in the development of next generational communication systems. It is well known that in wireless communication, especially, in mobile communications, it usually has a time varying channel, and often has Doppler frequency shift effect, which become big challenges to the wireless system designs. In order to handle these characteristics and face the challenges, the digital fountain coding is selected as the key technique in next generational wireless communication systems. This is because of the rateless coding property of fountain codes, no matter the channel erasure status is bad or not, if the receiver can correctly receive enough number of packets, then it can decode the messages. This property makes fountain codes useful in several application scenes, regardless of the concrete reception scenarios. In this thesis, in order to increase the efficiency of spectrum utilizing in wireless communication systems, we shall use the property that all the encoded packets of digital fountain coding have almost equal importance, and propose a novel asymmetric fountain-coded modulation design, which is suitable to the scenarios of the time varying channels in mobile communication. This design not only improves the efficiency of spectrum utilizing, but also utilizes all the received packets with good potential carried information in a best way. It will show that some hybrid sub-group modulation methods can have better performance than conventional BPSK and QPSK modulations. Firstly, it will briefly introduce the concept and recent developments of digital fountain coding, especially, for LT codes and Raptor codes. Secondly, we will analyze the encoding module of digital fountain coding and find some improvements, mainly in the following two aspects: 1) After investigating the encoding principle of digital fountain coding, we study how the pseudo-random generators affect the encoding of fountain codes; 2) After understanding the principle of LT codes over finite field, we propose a novel degree distribution function in LT codes over finite field. This function is suitable to be used in LT codes that have higher orders in finite field. Thirdly, based on the property that all the encoded packets of digital fountain coding have almost equal importance, we propose a novel hybrid BPSK/QPSK asymmetric fountain-coded mapping scheme, which can improve the efficiency of spectrum utilization. Since its hybrid sub-group modulation method, it has better performance than the classical BPSK and QPSK modulation, which are confirmed by theoretical analysis and simulations. Fourthly, because of the applications of mobile communication increasing rapidly, we also discuss the performance of the new developed asymmetric fountain-coded modulation design in the scenes of the mobile communication, especially in presence of heavy Doppler frequency shift effect. The outline of the investigation is as follows: Firstly to investigate the performance of classical LT codes with MPSK in the presence of Doppler frequency shift effect. Then, it will continue to investigate the performance of the novel hybrid asymmetric fountain-coded modulation design in the presence of Doppler frequency shift effect. Simulation results indicate that the proposed novel asymmetric fountain-coded modulation design has a good robustness to the remaining bias after Doppler frequency shift correction.

原文



完整版原文尚未提供或未到服务期;

[<<上一记录](#) [下一记录>>](#)