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基于Dechirp和多相滤波结构的超宽带通信系统

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An UWB Communication System Based on Dechirp and Polyphase Filter Structure

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摘要 该文提出了一种采用Dechirp和复多相滤波器组的超宽带通信系统。其发射信号采用开关键控(OOK)调制和Chirp扩频，接收信号经过Dechirp脉冲压缩、低通滤波和模数转换后，使用复多相滤波器组进行子信道划分，完成子信道选择和最大比合并，最后进行粗同步、精同步、信噪比估计和基于能量检测的OOK解调。通过理论推导与仿真实验，分析了在AWGN信道，IEEE 802.15.3a的CM1和CM4信道下该超宽带通信系统的性能。分析结果证明，该通信系统可以获得较高的处理增益和较强的抗多径性能，所以适合应用于拓展距离通信。

关键词： 无线通信 超宽带 Dechirp 复多相滤波器组 同步

Abstract： An Ultra Wide Band (UWB) communication system with Dechirp and complex polyphase filter bank is proposed. The transmitted signal uses On-Off Keying (OOK) modulation and Chirp spread spectrum. The received signal goes through the Dechirp pulse compression, low-pass filtering and analog-digital conversion processes, and the subchannel division is carried out through the complex polyphase filter bank, followed by the subchannel selection and maximum ratio combination. Finally, the coarse timing synchronization, fine timing synchronization, SNR estimation and OOK demodulation through energy detection are realized. By means of the theoretical analysis and simulation experiments, the performance of this UWB communication system is evaluated over the AWGN channel, IEEE 802.15.3a CM1 and CM4 channel. The results show that this UWB communication system can achieve high processing gain and good anti-multipath capability, and that it is suitable for range extension communications.

Keywords： Wireless communication Ultra Wide Band (UWB) Dechirp Complex polyphase filter bank Synchronization

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