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论文

基于Hadamard矩阵调制的空时频移键控

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摘要
针对现有的空时频移键控(ST-FSK)频谱利用率低的缺陷，该文提出了一种基于Hadamard矩阵调制的空时频移键控(HST-FSK)方案。HST-FSK采用Hadamard矩阵对一个新的FSK波形向量在空、时二维上作Kronecker扩展，由于新的FSK波形向量中引入了更多的参数，因而HST-FSK能够获得比ST-FSK更高的频谱利用率。作为一种特殊的酉空时编码，HST-FSK适合于任意发射天线数并且可以实现接收端无需信道估计的非相干检测。相比于其它的酉空时调制(USTM)方案，HST-FSK还具有编码设计简单、能够获得满天线分集等优点。理论分析及仿真实验表明，与已有典型的酉空时调制方案相比，在频谱利用率相同的条件下，HST-FSK与ST-FSK的误码性能相当。而在具有较高频谱利用率时，HST-FSK的误码性能明显优于基于系统设计的USTM。

关键词 发射分集 酉空时编码 频移键控 非相干检测

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Space-Time Frequency-Shift Keying Based on Hadamard Matrix Modulation

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Abstract
Focusing on the problem that existing Space-Time Frequency-Shift Keying (ST-FSK) incurs a spectral efficiency loss, this paper proposes a novel ST-FSK based on Hadamard matrix modulation coined as HST-FSK. HST-FSK uses the Hadamard matrix to expand a newly defined FSK waveform in both spatial and temporal dimensions according to the Kronecker product, and it achieves a higher spectral efficiency than ST-FSK owing to the more parameters are introduced into the new FSK waveform. As a special unitary space-time code, HST-FSK is appropriate for arbitrary number of transmit antennas and can be non-coherently detected with the absent of Channel State Information (CSI) at the receiver. Moreover, HST-FSK is easier to design and enjoys full antenna diversity, which are the advantages of HST-FSK over other Unitary Space-Time Modulation (USTM) designs. Theoretical analysis and simulation results show that compared with the existing typical USTM schemes, HST-FSK achieves a performance comparable to ST-FSK for the same spectral efficiency, and a better performance than the systematic designed USTM for high spectral efficiency.

Key words Transmit diversity Unitary space-time codes Frequency-Shit Keying (FSK) Non-coherent detection

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