

一类基于经典卷积码的量子稳定子码

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摘要 提出了一类新的量子稳定子码的构造方法. 寻找量子稳定子码的问题可以转化为寻找GF(4)上迹内积自正交的经典码问题. 根据这一关系, 首先证明了GF(4)上经典卷积码迹内积自正交的充要条件, 然后寻找满足该条件的经典卷积码, 再将找到的经典卷积码通过“咬尾”变换得到具有简单分组结构的tail-biting码, 证明了该类tail-biting码是迹内积自正交的, 从而构造出对应的量子稳定子码. 该类码构造方法简单, 码距接近理论上限.

关键词 [量子稳定子码](#) [经典卷积码](#) [tail-biting码](#) [迹内积](#) [自正交](#)

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A class of quantum stabilizer codes based on classical convolutional codes

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Abstract

A new class of quantum stabilizer codes is presented. The problem of finding stabilizer quantum-error-correcting codes can be transformed into the problem of finding self-orthogonal codes over the Galois field GF(4) under a trace inner product. Based on this connection, the necessary and sufficient condition is proved under which classical convolutional codes over GF(4) are self-orthogonal with respect to the trace inner product, and then corresponding codes satisfying the condition are found. Tail-biting codes with a simple block structure are obtained by "tail-biting" transformation, which are self-orthogonal with respect to the trace inner product. Finally, relative quantum stabilizer codes are constructed. The code construction is simple, and the minimum distance of the code approaches the upper bound.

Key words [stabilizer quantum-error-correcting codes](#) [classical convolutional codes](#) [tail-biting codes](#) [trace inner product](#) [self-orthogonal](#)

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