Information-Lossless Space-Time Block Codes From Division Algebras

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We describe a very general technique for constructing space-time block codes over any signal set $S \subseteq \mathbb{C}$ and for any number of transmit antennas, using representations of finite-dimensional cyclic division algebras $(K/F, \sigma, \delta)$ in $M_n(K)$, where $n = [K : F]$ and $< \sigma >= Gal(K/F)$. Here, F is a suitable subfield of $\mathbb{C}$ containing $\mathbb{Q}(S)$; we show that by choosing F, K, and δ appropriately, we can obtain codes that are information-lossless. We exhibit performance characteristics of our codes that show that our codes outperform previously known codes in terms of both information-losslessness and error probability.

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