Skew-hermitian skew-commuting matrices and fast-decodability of space-time codes

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The existence of $\mathbb{R}$-linearly independent invertible matrices A_i, $i \in I$ satisfying $A_i A_j^* + A_j A_i^*$ for certain distinct pairs $(i, j) \in I \times I$ arises naturally in the context of fast-decodability of space-time codes, which are a family of codes used in multiple-antenna wireless transmission. We describe the context, and then describe some results about the existence of such pairs. We show that the best-case decoding complexity of a full rate space-time code is unfortunately quite high, of the order of $|S|^{n^2+1}$ where S is the signal set and n is the number of antennas. Interestingly, we use the theory of Azumaya algebras to give a mild generalization of the Eckmann-Hurwitz-Radon bounds on the existence of pairwise skew-commuting matrices.

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