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PERMUTABLE SYMMETRIC HADAMARD MATRICES IN QUATERNION ALGEBRA AND ENGINEERING APPLICATIONS

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Abstract. In this paper, aiming to develop the group and out-of-group formalization of the symmetry concept, the preservation of a matrix symmetry after row permutation is considered by the example of the maximally permutable *normalized* Hadamard matrices which row and column elements are either plus or minus one. These matrices are used to extend the additive decomposition of a linear operator into symmetric and skew-symmetric parts using several commuting operations of the Hermitian conjugation type, for the quaternionic generalization of a vector cross product, as well as for creating educational puzzles and other applications.

MSC: 15B34, 05A05, 11R52
Keywords: Hadamard matrices, Hermitian additive decomposition, row permutations, symmetry, symmetrixes, triple generalization, vector cross product

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