

On edge-transitive factorizations of complete uniform hypergraphs

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This is joint work with Zaiping Lu

As a generalization of vertex-transitive self-complementary graph, homogeneous factorization of complete graph have been an active topic in recent years. We generalize the transitive factorizations of graphs to transitive factorizations of complete uniform hypergraphs. we classify the edge-transitive homogeneous factorizations of \mathcal{K}_n^k ($k \geq 3$) and the symmetric factorizations of \mathcal{K}_n^k ($k \geq 3$). Based on some classical results on simple groups and Kantor's classification of k -homogeneous but not k -transitive permutation groups (1972), we give several algebraic constructions for edge-transitive homogeneous factorizations of \mathcal{K}_n^k ($k \geq 3$) and symmetric factorizations of \mathcal{K}_n^k ($k \geq 3$). As a corollary of our classification result, we obtain all the symmetric self-complementary k -uniform hypergraphs, extending Peisert's classification of symmetric self-complementary graphs in 2001. Among these symmetric factorizations of \mathcal{K}_n^k with $k \geq 3$, only 8 of them are not 1-factorizations. As for edge-transitive homogeneous factorizations of \mathcal{K}_n^k with $k \geq 3$, no 1-factorization arises.