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On The Directed Hamilton-Waterloo Problem

Cycle decomposition is an important branch of graph decomposition problems. There are two well-known resolvable cycle decomposition problems where cycles can be partitioned into parallel classes, namely, 2-factors. One problem is the Oberwolfach problem where each 2-factor in the decomposition is isomorphic to a given 2-factor. Another problem is the Hamilton-Waterloo problem where each 2-factor can be isomorphic to one of the given two 2-factors. Both Oberwolfach and the Hamilton-Waterloo problems are mostly studied for uniform cycle factors so far.

Directed version of the Oberwolfach problem has started to gain more interest recently. Here, the decomposed graph is the complete symmetric directed graph K_v^*. Factors with uniform -directed- cycle size 3, with uniform cycle size 4, and with uniform cycle size m where $v \equiv 0(\mathrm{mod} 2m)$, m is odd with $5 \leq m \leq 49$ are among the results on this version of the problem (see [1], [2], and [3] respectively). Here we carry this directed generalization to the Hamilton-Waterloo problem and present our first results on small cycle sizes. This is joint work with Ugur Odabasi and Fatih Yetgin.

[1] Bermond J. C., Germa A., and Sotteau D. 1979, Resolvable decomposition of K_n^*, Journal of Combinatorial Theory, Series A, 26(2), 179-185.

[2] Bennett F. E., Zhang X., 1990, Resolvable Mendelsohn designs with block size 4, aequationes mathematicae, 40(1), 248-260.

[3] Burgess A., Francetic N., Sajna M., 2018, On the directed Oberwolfach Problem with equal cycle lengths: the odd case. Australas. J. Combin., 71(2), 272-292.