Almoast Resolvable k-cycle Systems

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(joint work with Curt Lindner and Alexander Rosa)

A *k-cycle system* of order n is a pair $(X, \mathcal{C})$ where $\mathcal{C}$ is a collection of edge disjoint k-cycles which partition the edge set of the complete undirected graph K_n with $V(K_n) = X$. A k-cycle system $(X, \mathcal{C})$ is said to be *resolvable* if the cycles belonging to $\mathcal{C}$ can be partitioned into parallel classes.

If $(X, \mathcal{C})$ is a k-cycle system of order n and k does not divide n then we cannot have a parallel class of k-cycles. The closest we can come to a parallel class is a collection of $(n-1)/k$ vertex disjoint k-cycles; any such collection is called an *almost parallel class*. The maximum possible number of edge disjoint almost parallel classes in a k-cycle system of order n is $(n-1)/2$ in which case a half parallel class containing $(n-1)/2k$ vertex disjoint k-cycles is left over. A k-cycle system of order n whose k-cycles can be partitioned into $(n-1)/2$ almost parallel classes and a half parallel class is said to be *almost resolvable* and is denoted by k-ARCS(n).

The existence of 3-ARCSs was settled in 1993 by H. Hanani. Moreover, quite recently I. Dejter, C. Lindner C. Rodger and M. Meszka proved the existence of 4-ARCSs. A complete solution for $k = 6$ as well as a complete solution with one possible exception for $k = 10$ and 14 will be presented.

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