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A recursive construction of solutions to the directed Oberwolfach problem

The celebrated Oberwolfach problem, over 50 years old and in general still open, asks whether n participants at a conference can be seated at k round tables of sizes $m_1, \ldots, m_k$ (where $m_1 + \ldots + m_k = n$) for several meals so that everybody sits next to everybody else exactly once. This problem can be modeled as a decomposition of the complete graph K_n into 2-factors, each consisting of k disjoint cycles of lengths $m_1, \ldots, m_k$.

In the directed version, we are interested in decomposing K_n^*, the complete symmetric digraph of order n, into spanning subdigraphs, each a disjoint union of k directed cycles of lengths $m_1, \ldots, m_k$ (where $m_1 + \ldots + m_k = n$). Such a decomposition models a seating arrangement of n participants at k tables of sizes $m_1, \ldots, m_k$ such that everybody sits *to the right* of everybody else exactly once.

While the Oberwolfach problem for cycles of uniform length was solved decades ago, the solution to the directed version for uniform-length cycles was completed only in 2023, and while many infinite families of cases of the Oberwolfach problem with variable cycle lengths are known to have a solution, very little is known about the directed version with variable cycle lengths. In this talk, we present a recursive construction that generates solutions to many infinite families of cases of the directed Oberwolfach problem with variable cycle lengths. In particular, we obtain an almost-complete solution to the two-table directed Oberwolfach problem.

This is joint work with Suzan Kadri.