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The Honeymoon Oberwolfach Problem: A Recursive Approach

The *Honeymoon Oberwolfach Problem* (HOP), first introduced by Mateja Šajna, is a variant of the Oberwolfach Problem (OP). The problem asks whether it is possible to seat n couples at ℓ round tables of sizes $2m_1, 2m_2, \ldots, 2m_\ell$ for $2(n-1)$ consecutive nights, such that $m_i \geq 2$ for all $i = 1, \ldots, \ell$, $\sum_{i=1}^{\ell} m_i = 2n$, and each participant must be seated next to their spouse every night, but next to every other participant exactly once. This problem is denoted by $HOP(2m_1, 2m_2, \ldots, 2m_\ell)$.

This seating arrangement problem translates naturally into a graph theoretic problem. It is equivalent to finding a cycle decomposition of the graph $K_{2n} + (2n-3)I$ (that is, the complete graph K_{2n} with $2n-3$ additional copies of a fixed 1-factor I) into 2-factors such that each 2-factor consists of disjoint I-alternating cycles of lengths $2m_1, \ldots, 2m_\ell$. So far, solutions to HOP have been established in various cases, including: all $n \leq 20$; the case when all tables are of the same size; the case when all table sizes are divisible by 8; and the case when n is odd and $OP(m_1, \ldots, m_\ell)$ has a solution.

In this talk, we present a recursive approach to the problem. In particular, we show that if $m_1, \ldots, m_\ell$ are positive even integers, t is an integer satisfying $\sum_{i=1}^{\ell} m_i < t$, and $HOP(2m_1, \ldots, 2m_\ell)$ has a solution, then $HOP(2m_1, \ldots, 2m_\ell, 2t)$ also has a solution. Moreover, we briefly discuss the case when $m_1, \ldots, m_\ell$ are not all even.

This is joint work with Mateja Šajna.