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A Complete Solution to the Generalized HOP with One Round Table

The Honeymoon Oberwolfach Problem (HOP), introduced by Šajna, is a recent variant of the classic Oberwolfach Problem. This problem asks whether it is possible to seat $2m_1 + 2m_2 + \dots + 2m_t = 2n$ participants, consisting of n newlywed couples, at t round tables of sizes $2m_1, 2m_2, \dots, 2m_t$ for $2n - 2$ successive nights, so that each participant sits next to their spouse every night and next to every other participant exactly once. This problem is denoted by $\text{HOP}(2m_1, 2m_2, \dots, 2m_t)$. Jerade, Lepine, and Šajna have studied the HOP and resolved several important cases.

We generalized the HOP by allowing tables of size two, relaxing the previous restriction that tables must have a minimum size of four. In the generalized HOP, we aim to seat the $2n$ participants at s tables of size 2 and t round tables of sizes $2m_1, 2m_2, \dots, 2m_t$, where $2n = 2s + 2m_1 + 2m_2 + \dots + 2m_t$ and $m_i \geq 2$, while preserving the adjacency conditions of the HOP. We denote this problem by $\text{HOP}(2^{(s)}, 2m_1, \dots, 2m_t)$.

In this talk, we present a general approach to this problem and provide a solution to the generalized HOP with one round table, showing that the necessary condition for $\text{HOP}(2^{(s)}, 2m)$ to have a solution is also sufficient.