Classification of labeled grids

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By a labeled graph we understand a pair (G, K) where G is a graph and $K : E \mapsto S_n$ is a function assigning permutations of $[n] = \{0, ..., n-1\}$ to the edges of G. Labeled graphs can be interpreted as a generalization of signed graphs. We define an eqivalence between labeled graphs as a generalized version of signed graph equivalence. In particular, we focus on grid graphs labeled with specific classes of permutations. We try to determine whether two labelings of a grid are equivalent based solely on individual cells, or chordless cycles, in the grid.

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