

Question 2 - State Space

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(a) Number of tiles in (m, n, k) - puzzle

The number of tiles is $mn - k$

(b) Distinct states in the state space

First, we chose k spaces from mn possible places. Then, we have permutration of $mn-k$ states to be counted as distinct states.

Thus, the answer is $\binom{mn}{k}(mn - k)!$

(c) Graph of state space of a $(2, 2, 1)$ -puzzle

There are 2 group of states: 1 - we can achieve the goal state, 2 - cannot achieve the goal state. Graph is below (2nd page).

Note: there are 3 pair of nodes which might look confusing. For some reasons nodes were not be able to stay in different location to avoid this awkward intersection(overlapping) of edges.

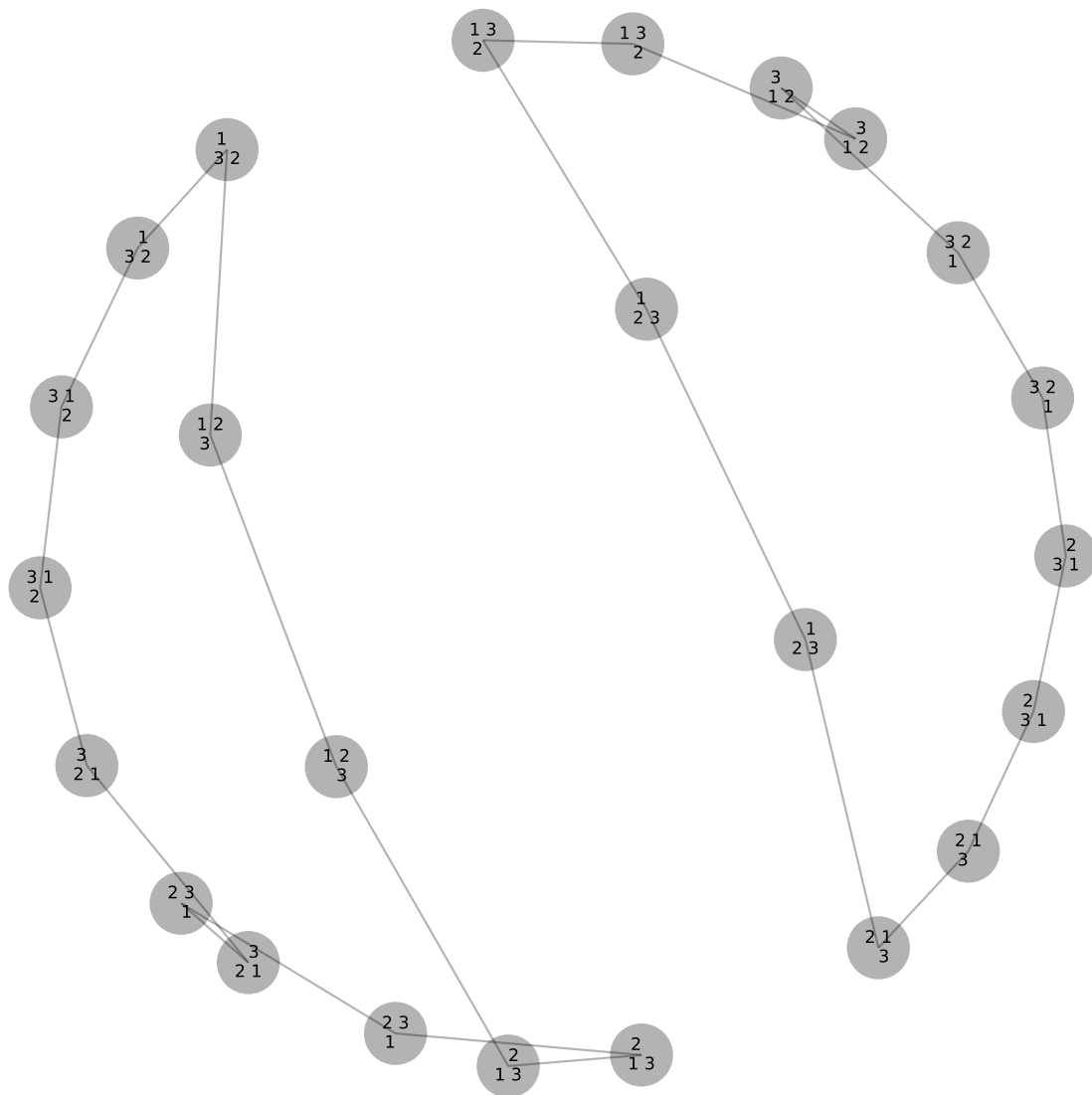


Figure 1: Graph of state spaces