Problem Formulation - 8 Puzzle

* **States**
  + States are specified by the location of the tiles numbered 1-8 and the blank tile in the 3x3 grid of squares, where each tile occupies exactly one of the 9 squares.
* **Initial State**
  + Any state can be the initial state as long as it can be reached by a series of legal moves beginning from the goal state. Note that not all random permutations of the 9 tiles can be designated as the initial state (see Berlekamp et al. (1982)).
* **Actions**
  + Legal actions consist of the swapping the blank tile with any of the adjacent tiles in the directions of {Left, Right, Up, Down}. Not all these directions are always available to be swapped and their availability depends on the location of the blank tile.
* **Transition Model**
  + Provided with a state and an action, the resulting state is defined as swapping the blank tile with the tile adjacent to it in the direction specified by the action.
* **Goal Test**
  + Consists of checking whether the configuration of 9 tiles is exactly as follows:

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 7 | 8 | Blank |

* **Path Cost**
  + Each step has a cost of 1, so the cumulative cost of the path is equal to the total number of steps.