**Eight-Puzzle Problem Project**

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The **Eight-Puzzle** problem is formulated as such:

Given a 3x3 board with the numbers 1 to 8 on the eight of the squares, move the numbers on the board through the single empty square until a specific goal state is achieved. Each time only numbers beside the empty square can be moved into the square through either of the following moves: up, down, left, right.

**The A\* algorithm is like the best-first search algorithm expect each time it chooses the node that has the lowest sum of heuristic approximation and cost to node (cost from initial state to node).**

The python program submitted contains 2 classes:

* The **eightPuzzleNode** is initiated with either an array or a file containing the 8-puzzle problem along with the parent of the instance and its depth, it also has a function that sets the cost that it takes to arrive at the instance.
* the **eightPuzzleAgent class** takes as initiation arguments a heuristic choice of ‘manhattan’ or ‘displacement’, along with a specific goal state provided as an numpy array. It then can compute the path to the solution with the **AstarSolver** function which takes as input an instance of class **eightPuzzleNode.** The function to move the numbers is the function **generateChild**, which expands the current node into all possible child nodes by moving the numbers beside the empty square on the board. The **check\_hist** function checks if the child node generated has been seen before or not. The **check\_goal** function checks if a node matches the solution we wish to achieve. The **manhattan** functionand the **displacement** function calculate the heuristics of the node state. The **switchNumbers** function is simply a function to switch numbers on the board matrix. Finally, the **output\_result** function outputs the path from the initial problem to the solution along with the number of nodes expanded, number of unique nodes generated and the total number of nodes generated.

**The results are provided within a Jupyter Notebook for convenient viewing.**