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Assignment 2 Report – Heuristic Search
CSE 415: Introduction to Artificial Intelligence
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1. Results with Heuristics for the Eight Puzzle

Puzzle	Heuristic	Solved?	# Soln Edges	Soln Cost	# Expanded	Max OPEN
A	None (UCS)	Y	7	7.0	166	101
A	Hamming	Y	7	7.0	7	6
A	Manhattan	Y	7	7.0	7	6
B	None (UCS)	Y	12	12.0	1490	898
B	Hamming	Y	12	12.0	95	72
B	Manhattan	Y	12	12.0	34	25
C	None (UCS)	Y	14	14.0	4070	2290
C	Hamming	Y	14	14.0	195	127
C	Manhattan	Y	14	14.0	56	39
D	None (UCS)	Y	16	16.0	7982	4700
D	Hamming	Y	16	16.0	592	368
D	Manhattan	Y	16	16.0	155	98

Puzzle A: [3,0,1,6,4,2,7,8,5]
Puzzle B: [3,1,2,6,8,7,5,4,0]
Puzzle C: [4,5,0,1,2,8,3,7,6]
Puzzle D: [0,8,2,1,7,4,3,6,5]

2. Evaluating Our Custom Heuristics

We see that implementing an admissible heuristic greatly improves the performance of the search algorithm. Both the number of states expanded and the maximum open list decrease exponentially, indicating less cost to computing power and memory required to solve the puzzle. We also note that the Manhattan distance is a better heuristic than Hamming, which likely comes from the fact that the former dominates the latter (i.e. greater or equal static evaluation for each possible state away from the goal node). This dominance becomes more evident for more difficult solution paths, which tells us that a well-designed heuristic function is important to more difficult problems that encroach upon our computing power.