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Project 6 Report

The brute force method was implemented to calculate the exact shortest tour by considering all permutations. The MST produced a decent but not necessarily optimal solution approximation by building a minimum spanning tree and performing a preorder walk. As far as running times go the brute force method took a considerable amount of time longer than the MST with the brute force ranging from 3046.66 seconds to 3129 seconds and the MST running as fast as 5.2 seconds.

There is of course an error ratio when it comes to approximation; it was the highest with Graphs 5 and 6. Graph 5 had an error ratio of 1.31 and Graph 6 had an error ratio of 1.28. The MST algorithm does okay at best with approximating the exact answer and should be used as a tool for a ballpark idea for the best possible solution. Some of the properties that made the MST approximations worse than others seemed to be routes that include edges that significantly deviate from the direct path between cities, or routes that had inefficient TSP tours.

Some techniques that could speed up the brute force algorithm would be to implement a possible “pruning” function that can eliminate permutations that are no longer the current best solution. Another technique could be to utilize parallel processing if it is being run on hardware that can handle it.

Data:

	Brute Force Distance	MST Distance	Ratio (MST/Brute)
1	344.71	369.91	1.07
2	357.99	433.45	1.21
3	344.69	403.81	1.17
4	341.64	397.90	1.16
5	331.76	433.34	1.31
6	263.28	335.7	1.28
7	361.07	455.48	1.26
8	296.01	357.78	1.21
9	331.66	380.91	1.15
10	325.99	377.91	1.16

