Held-Karp Algorithm to Approximate Solutions to the Traveling Salesperson Problem

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Abstract

The Traveling Salesperson Problem has long been one of the most visible NP-Complete problems in the fields of computer science and mathematics. What follows is an examination and implementation of a Held-Karp algorithm for quickly approximating solutions to this problem. This dynamic programming algorithm will be compared to a greedy approximation, random path, and a branch-and-bound algorithm. Our intention is to show that the dynamic Held-Karp algorithm’s relative optimization in terms of accuracy and time/space complexity.

1. Introduction

The Traveling Salesperson Problem (TSP) is especially confounding to scientists, because of the cognitive gap between understanding the problem and being able to efficiently find the true solution. Included in this report will be a explanation of the greedy algorithm for approximating a solution to the traveling salesperson problem, and a further exploration into the Held-Karp dynamic programming algorithm which attempts a more accurate approximation. We will be comparing the time and space complexity of these implementations of these two algorithms, as well as providing empirical evidence supporting

We will first discuss our implementation of a greedy algorithm which finds a temporary solution to the TSP problem. We use this solution, as well as the solution provided by a random tour, in establishing a baseline of comparison. After we discuss our implementation of the Held-Karp, we will present a comparison of results between these three algorithms as well as our previous implementation of the Branch and Bound algorithm. After this presentation we will give a short conclusion, followed by the resources that we have used.

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