UNIVERSITY OF BIRMINGHAM

A Comparison of Approaches to Combinatorial Optimization for Touristic Route Planning

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Contents

Abstract

Write abstract

1 Introduction

Write introduction

2 Problem Formulation

2.1 Problem Description

Given a positive integer d and a graph $G = (V, E)$, where V is set of locations including a designated central node C and E is a set of weighted edges linking every location to every other location, as well as a duration function $D(v)$ assigning a duration to each node $v \in V$, find a route that:

1. Visits all nodes $V \setminus C$ once.

2. Starts and finishes at C, having visited it d times, without ever visiting consecutively.

3. Minimizes both the cumulative edge weights in the route and the variance in cumulative weight between each visit to C.

2.2 Inputs and Outputs

Inputs:

- $d \in \mathbb{Z}^+$: The number of times C should be visited in a route. Contextually, d represents the number of days a tourist will spend on their trip.

- $G = (V, E)$: A pair comprising:

  - V: A set of nodes $v \in V$.
    - $v \in V$: A pair of latitude and longitude coordinates[1]. Contextually, v represents a location the tourist would like to visit in their trip.
  - E: A set of edges $(a, b) \in E$ that connects every node to every other node, bidirectionally.
    - $(a, b) \in E$: A directional edge linking a and b with a weight indicating travel time. Contextually, (a, b) represents how a tourist will get from a to b.

- $C \in V$: Central node which should be visited d times. Contextually, C represents where the tourist is staying and will return to at the end of each day.

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[1]While the coordinates of our locations are included in V, they are not directly tied to the weight of our edges E, which are based on travel time and not distance.

3 Literature Review

Write literature review

4 Algorithms Investigated

Paragraph describing different types of algorithm used (Routing, Cluster and Routing, Evolutionary, etc.)

4.1 Brute Force

Write brute force explanation

4.2 Clustering

Write clustering explanation

Once divided into clusters, each cluster can be solved using our brute force method (with $d = 1$) or with traditional TSP algorithms. TSP algorithms implemented in this project include:

4.3 Greedy

Write greedy explanation

5 Evaluation and Comparison

Write paragraph about experiment process. Comparison based on computation time and route evaluation. Describe how route is evaluated. Describe data being tested on.

6 Conclusion

Write conclusion

7 Bibliography

Fill in bibliography