C950 Task-1 WGUPS Algorithm Overview

(Task-1: The planning phase of the WGUPS Routing Program)

Alexander Fair

ID # 001574781

WGU Email: afair26@wgu.edu

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C950 Data Structures and Algorithms II

# Introduction

The purpose of this assignment is to create a program that will use algorithms to route 3 trucks with 2 drivers to deliver 40 packages while staying under a total of 140 miles traveled for 2 of the trucks.

# A. Algorithm Identification

Nearest Neighbor Algorithm

# B. Data Structure Identification

For the package list, create a hash table where the key is the package ID and the package info is stored in the buckets.

For the address list, create a dictionary where the key is an address identifier (unique address ID number) and the value is the full address details.

For the distance table, create a dictionary where each key is a tuple of address identifiers representing a pair of addresses, and the value is the distance between them.

B1. Explanation of Data Structure

The hash table provides constant time complexity *O*(1), for search insert and delete operations on average, which is crucial for quickly accessing package details based off their ID’s during the routing process. Hash tables also have well-defined methods for handling collisions ensuring that even in the cases of key conflicts, package data remains accessible and distinct. Hash tables also allow for flexible handling of package data, including addresses, delivery deadlines, delivery status, and weight. The flexibility is essential for dynamically updating package statuses or requirements as routing decisions are made.

# C1. Algorithm’s Logic

BEGIN optimized\_delivery WITH truck

CREATE an empty list for unsorted\_packages

FOR EACH package\_id in truck's load

FIND package using package\_id

ADD package to unsorted\_packages list

END FOR

EMPTY truck's load

WHILE there are packages in unsorted\_packages

SET closest\_package as the first package in unsorted\_packages

FOR EACH package in unsorted\_packages

IF package is closer to truck's current location than closest\_package

SET closest\_package to this package

END IF

END FOR

MOVE closest\_package from unsorted\_packages to truck's load

UPDATE truck's location to closest\_package's destination

UPDATE truck's mileage and time based on distance to closest\_package

MARK closest\_package as delivered

END WHILE

END optimized\_delivery

# C2. Development Environment

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# C3. Space and Time complexity using Big-O notation

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# C4. Scalability and Adaptability

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# C5. Software Efficiency and Maintainability

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# C6. Self-Adjusting Data Structures

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# C7. Data Key

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# D. Sources

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An example:

Lysecky, R., & Vahid, F. (2018, June). *C950: Data Structures and Algorithms II*. zyBooks.

Retrieved March 22, 2021, from <https://learn.zybooks.com/zybook/WGUC950AY20182019/>

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