C950 Task-1 WGUPS Algorithm Overview

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

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C950 Data Structures and Algorithms II

# Introduction

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# A. Algorithm Identification

For this program, I will be utilizing the greedy algorithm to optimize the delivery route. This will ensure the truck takes the shortest possible route between packages to maximize speed.

# B. Data Structure Identification

I will be using a chained hash table to store all the package details.

# B1. Explanation of Data Structure

Using a hash table will make the data readily available and easy to search through. Hashing will be based on the package ID. To avoid collisions, I will utilize basic chaining in the buckets.

# C1. Algorithm’s Logic

-Create a hash table for the packages with 5 buckets

-Load each truck that has a driver with the max amount of packages the truck can hold

-Create a list with the packages\_per\_truck to show what packages each truck has

-Create a list with truck\_location to show where all the trucks are at

-Check the packages\_per\_truck to see if the current truck is empty

-If there are still packages, in a for loop

--Find the next nearest location

--Set the truck to go that location

--Deliver package

--Update the current truck\_location

-If the truck runs out of packages, return to the hub to reload

# C2. Development Environment

For this project, I will be using Visual Studio Code IDE in conjunction with Python 3.12.7. As for hardware, I will be using my desktop compute running Windows 10.

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

-Opening the CSV file and reading it – O(n)

-Creating the hash table – O(n)

-Loading the truck – O(n^3)

-Delivering the packages - O(n^2)

-Overall – O(n^7)

# C4. Scalability and Adaptability

My solution is scalable to adapt to a growing number of packages in the sense that the average run time will be lower than the space-time complexity would suggest. For example, loading the truck is O(n^3), but n is the max number of packages per truck, which is a relatively small number. The biggest scalability issue is the number of trucks/drivers.

# C5. Software Efficiency and Maintainability

The software design is efficient and easy to maintain because of the use of classes and abstraction. Trucks and packages will be kept in classes, making it efficient to write new code for. All functions of those trucks will be abstracted into functions, which makes it very easy to understand and therefore maintain.

# C6. Self-Adjusting Data Structures

Strengths:

Efficient insertion and search

Collision resolution options readily available

Weaknesses:

Does not maintain order of elements

Fixed size

Dependent on the quality of hash function

# C7. Data Key

For the hash function, I will use the package ID as the key because it will ensure that every number run through the hash function is unique, which should ensure an even spread among the buckets.

# D. Sources

GeeksforGeeks. (2023, March 28). Applications, advantages and disadvantages of hash data structure. <https://www.geeksforgeeks.org/applications-advantages-and-disadvantages-of-hash-data-structure/?ref=shm>

GeeksforGeeks. (2024a, September 15). Program for hashing with chaining. <https://www.geeksforgeeks.org/c-program-hashing-chaining/?ref=gcse_outind>#

GeeksforGeeks. (2024b, November 5). Greedy algorithms. <https://www.geeksforgeeks.org/greedy-algorithms/?ref=shm>

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