1. The nearest neighbor algorithm is a self-adjusted algorithm that could be used to create my program to deliver the packages. In this type of greedy algorithm, when determining which node to visit next, the nearest unvisited node is selected.
2. A hash table is a self-adjusted data structure that stores unordered items by mapping the item to a location in an array. This could be used with the nearest neighbor algorithm to store package data.
   1. The data component to store are packages. These packages will have a few attributes: ID, Address, Delivery deadline, and Weight. The package object can be created to organize the attributes. The hash table will use the package ID as the key to match the entire package object which will have all the package information.



Function PlotRoute()

CREATE empty list route\_list

CREATE list unvisited\_addresses = import addresses from package table

WHILE unvisited\_addresses != 0 {

SET curr\_location = home

SET next\_address = NONE

SET min\_distance = ∞

FOR i=0 to unvisited\_addresses.length {

SET selected\_address = unvisited\_address[i]

SET distance = ABSOLUTE VALUE(curr\_location – selected\_address)

IF distance LESS THAN min\_distance{

SET min\_distance = distance

SET next\_address = selected\_address

END IF

END FOR

APPEND route\_list(next\_address)

REMOVE unvisited\_addresses(selected\_address)

SET curr\_location = next\_address

END WHILE

APPEND route\_list(home)

END PlotRoute()

* 1. I will be using the Pycharm IDE, with Python 3.12 on my Windows 11 Dell Inspiron 16 5630 13th Gen Intel(R) Core(TM) i7-1360P, 2200 Mhz, 12 Core(s), 16 Logical Processor(s)

|  |  |  |
| --- | --- | --- |
| **Segment** | **Time Complexity** | **Space Complexity** |
| Package object data initialization | O(1) | O(n) |
| Package Hash Table inserts and searches | O(1) | O(n) |
| Truck object Initialization | O(1) | O(1) |
| PlotRoute() function | O(n^2) | O(n) |
| Iterating through route\_list to deliver packages on set route | O(n) | O(n) |
| *Overall time complexity of the program* | O(n^2) | O(n) |

* 1. With a Hash table being a self-adjusting data structure that has fast insertion and search methods, the number of packages should scale very well.

* 1. The time complexity for the entire program will be O(n^2).Using a self-adjusting data structure and algorithm will make the program efficient. Using object-oriented-programming and lots of comments will make the program easy to maintain.
  2. The main advantages of a hast table are access if the key is known, and insertion speed. Major disadvantages of hash tables are inefficient memory usage, and slow access time if the key is not known.
  3. Keys in hash tables are ideally unique. The package ID is the only unique component and therefore the best choice.

1. Sources
   1. Zybooks – C950: Data Structures and Algorithms II
   2. Data Structures and Algorithms II C950 course search:
      1. Webinars 1-4
      2. Guide to Pseudocode.pdf
      3. Sample Core Algorithm Overview