Luke Williams

Preety Kahatri

C950

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C950 Task Two

E.

This shows that packages have been delivered and mileage

```
Total mileage for all trucks: 81.00 miles
Mileage for Truck 1: 48.80 miles
Mileage for Truck 2: 25.80 miles
Mileage for Truck 3: 6.40 miles
All packages have been delivered!

Options:
1. Check package status
2. Check package checkpoints
3. Exit
Enter your choice:
```

F. Justify the package delivery algorithm used in the solution as written in the original program by doing the following:

1. Describe **two or more** strengths of the algorithm used in the solution.

   The algorithm is efficient due to its greedy approach, which selects the nearest package for delivery, potentially minimizing travel time and distance. Additionally, it prioritizes packages with the most urgent deadlines, ensuring time-sensitive deliveries are completed first, a crucial aspect of effective delivery service.

2. Verify that the algorithm used in the solution meets *all* requirements in the scenario.

   The algorithm meets the scenario's requirements by:

   Handling Special Instructions: It includes logic to handle special instructions for packages, which may affect delivery order or require specific actions.

   Optimizing Delivery Routes: By using the greedy method to select the nearest package for delivery, the algorithm works towards optimizing routes, which is likely to reduce overall delivery times and distances.

Dynamic Time Tracking: The algorithm tracks current time dynamically and calculates expected delivery times, which helps in meeting delivery deadlines and provides the ability to check package status at different times of the day.

Limiting Package Loads: It respects a maximum limit of packages per delivery turn, which could correspond to physical limitations of the trucks or operational rules of the delivery service.

3. Identify **two** other named algorithms that are different from the algorithm implemented in the solution and would meet *all* requirements in the scenario.

Dijkstra's Algorithm and Genetic Algorithm

a. Describe how *both* algorithms identified in part F3 are different from the algorithm used in the solution.
    a. Both Dijkstra's and Genetic Algorithms differ from the greedy approach in that they don't make decisions based solely on immediate proximity; they consider a broader set of possibilities and seek to optimize the route based on a global perspective (all destinations considered) or through iterative improvement over time, potentially leading to more efficient overall solutions at the cost of higher computational complexity.

G. Describe what you would do differently, other than the two algorithms identified in part F3, if you did this project again, including details of the modifications that would be made.

I would implement a route optimization algorithm and make it dynamic so it could adapt throughout the day and allow the schedule to be updated real time.

H. Verify that the data structure used in the solution meets *all* requirements in the scenario.
The chaining hash table is suitable for the package delivery system due to its efficient lookup, insertion, and deletion operations, which are typically O(1) on average. It allows quick access to package information using package IDs, which is essential for real-time package tracking and updating delivery statuses.

1. Identify **two** other data structures that could meet the same requirements in the scenario.
    a. Balanced binary search tree or dynamic array

a. Describe how *each* data structure identified in H1 is different from the data structure used in the solution.
    a. Balanced Binary Search Trees (BSTs) maintain sorted data and offer more predictable O(log n) performance for various operations, unlike hash tables which might perform poorly with many collisions. BSTs excel in range queries without needing hashing. On the other hand, dynamic arrays allow for constant-time indexing access, but their search, insert, and delete operations are less efficient than those of a hash table, particularly when unsorted. They may also use extra memory due to resizing, while hash tables use memory more efficiently, allocating only for actual elements and pointers.