

Logistics Management System



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Course Code: CSC 1012 – Introduction to Computer Programming

GitHub Repository URL: <https://github.com/UshaniKavisha/logistics-management-system.git>

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Contents

| Topic | page |
|--|------|
| 1. Introduction..... | 01 |
| 2. Objective..... | 01 |
| 3. System Overview..... | 01 |
| 4. System Functional Requirements..... | 02 |
| 5. Program Structure..... | 03 |
| 6. Program Flowchart..... | 04 |
| 7. Sample Outputs and Screenshots..... | 05 |
| 8. Conclusion..... | 11 |

1. Introduction

This project is a menu-driven logistics management system developed using the C programming language for the course CSC 1012. In this program key programming concepts are applied key programming concepts such as arrays, functions, loops, conditionals, to simulate a simple logistics and delivery management system that handles cities, delivery routes, vehicle types, fuel consumption, and order costs.

2. Objective

The objective of this project is to design and implement a logistics management system that can:

- Manage cities and distances between them
- Handle customer delivery requests
- Estimate delivery time and cost
- Track completed deliveries
- Generate performance reports

3. System Overview

The Logistics Management System allows users to add, rename, remove cities, enter distances between cities, and select vehicles for deliveries. It can also find the least-cost (least-distance) route between cities.

In addition, the system generates a performance report that includes the total number of deliveries completed, total distance covered, average delivery time, total revenue and total profit, and the longest and shortest routes completed.

4. System Functional Requirements

- City Management

- Store up to 30 cities.
- Each city must have a unique name.
- Functions: addCity(), renameCity(), removeCity(), listCities.

- Distance Management

- Use a 2D array to store distances between cities (int distance [MAX_CITIES] [MAX_CITIES]).
- Ensure distance are symmetrical (distance[i] [j] = distance[j] [i]).
- Prevent invalid entries (distance to itself = 0).
- Functions: initializeDistance (), enterDistance(), displayDistance().
- Display the distance table neatly formatted.

- Vehicle Management

- Three vehicle types: Van, Truck, and Lorry.
- Store their capacity (kg), Rate per km (LKR), Average Speed (km/h) and Fuel Efficiency (km/l).
- Functions: displayVehicle(), chooseVehicle().

- Delivery Request Handling

- Input source city index, destination city index, weight, and vehicle type (0=Van, 1=Truck, 2=Lorry).
- Validate that the weight does not exceed vehicle capacity and source ≠ destination.
- Function: deliveryRequestHandling().

- Cost, Time, and Fuel Calculations

- Delivery Cost = Distance × Rate × (1 + Weight/10000)
- Estimated Delivery Time (hours) = Distance / Speed

- Fuel Consumption = Distance / Efficiency
- Fuel Cost = Fuel Consumption × Fuel price
- Total Operational Cost = Delivery Cost + Fuel Cost
- Profit = 25% markup on base cost
- Customer Charge = Total Cost + Profit

- Finding The Least-Cost Route (Least-Distance)
 - Finds the shortest route between two cities.
 - Compares all possible paths for up to 4 cities.
 - Function: findLeastCostRoute(startIndex, endIndex).

- Performance Reports
 - Total deliveries, total distance, average time, total profit and the longest and shortest routes distance.
 - Function: performanceReport().

- File Handling
 - Maintain .txt files to store data.
 - Functions: loadRoutes(),saveRoutes(),loadDeliveries(),saveDeliveries().

5. Program Structure

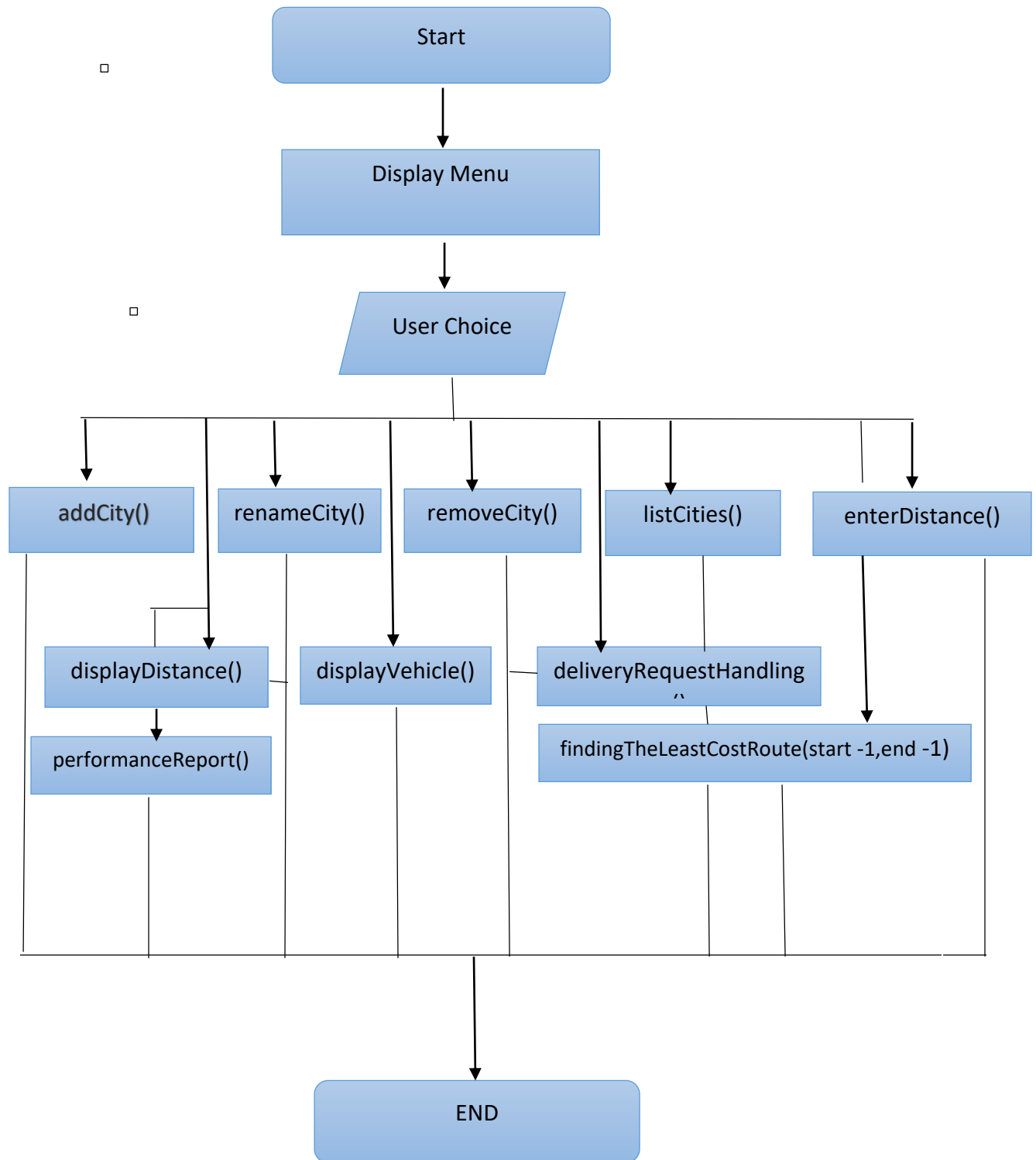
The program is modular and divided into several functions. Each function performs a specific task for better readability and maintenance.

Example function structure:

```
void addCity();
void initializeDistance();
void deliveryRequestHandling();
void findLeastCostRoute();
void performanceReport();
```

The main() function displays a menu and calls the relevant functions based on user selections.

6. Program Flowchart



7. Sample Outputs and Screenshots

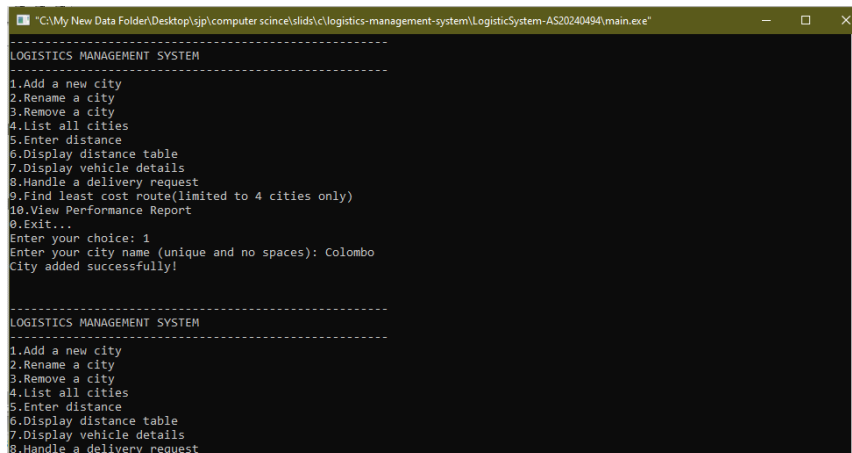
Figure 1: Main Menu



```
"C:\My New Data Folder\Desktop\jsp\computer science\slides\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"
-----
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: _
```

Displays all available options such as city management, delivery handling, and reports.

Figure 2: Adding Cities

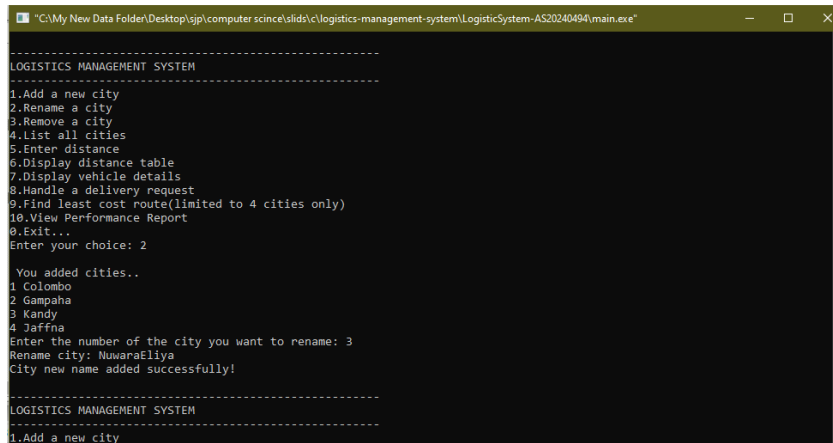


```
"C:\My New Data Folder\Desktop\jsp\computer science\slides\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"
-----
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 1
Enter your city name (unique and no spaces): Colombo
City added successfully!

-----
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
```

Shows how new cities are added to the system.

Figure 3: Rename Cities



```
"C:\My New Data Folder\Desktop\sjp\computer science\slids\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"

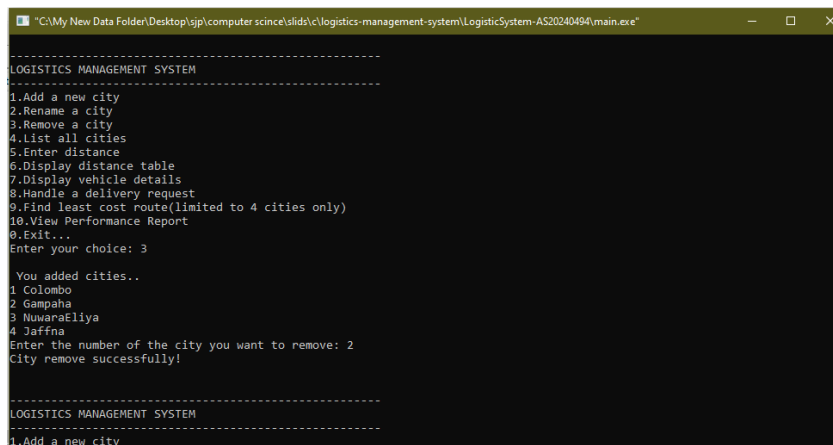
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.list all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 2

You added cities..
1 Colombo
2 Gampaha
3 Kandy
4 Jaffna
Enter the number of the city you want to rename: 3
Rename city: NuwaraEliya
City new name added successfully!

LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
```

Shows how the program renames a city using the Rename City option.

Figure 4: Remove Cities



```
"C:\My New Data Folder\Desktop\sjp\computer science\slids\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"

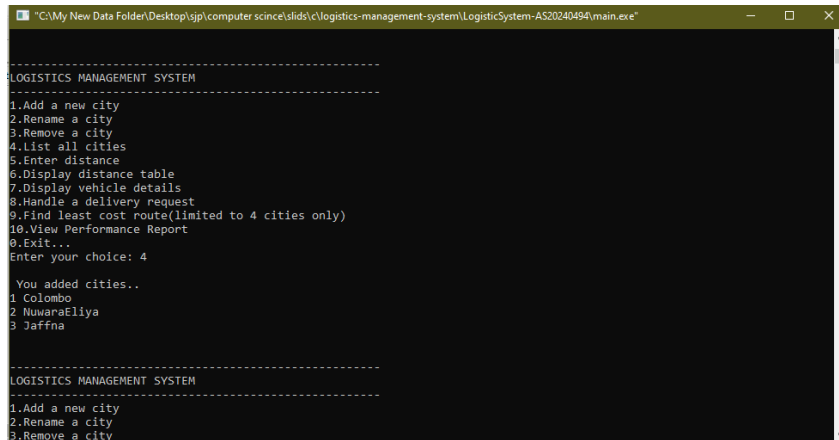
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.list all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 3

You added cities..
1 Colombo
2 Gampaha
3 NuwaraEliya
4 Jaffna
Enter the number of the city you want to remove: 2
City remove successfully!

LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
```

Shows how the program Remove City option.

Figure 5: List All Cities



```
"C:\My New Data Folder\Desktop\jsp\computer science\slids\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"

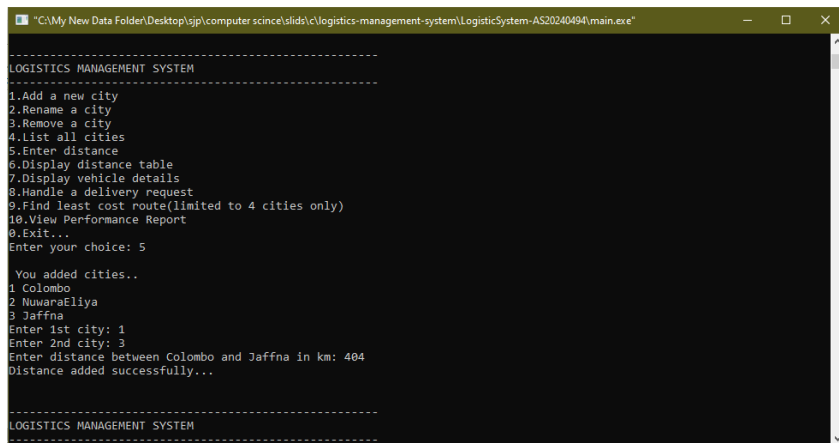
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.list all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 4

You added cities..
1 Colombo
2 NuwaraEliya
3 Jaffna

LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
```

Displays all added cities currently stored in the system

Figure 6: Enter Distance



```
"C:\My New Data Folder\Desktop\jsp\computer science\slids\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"

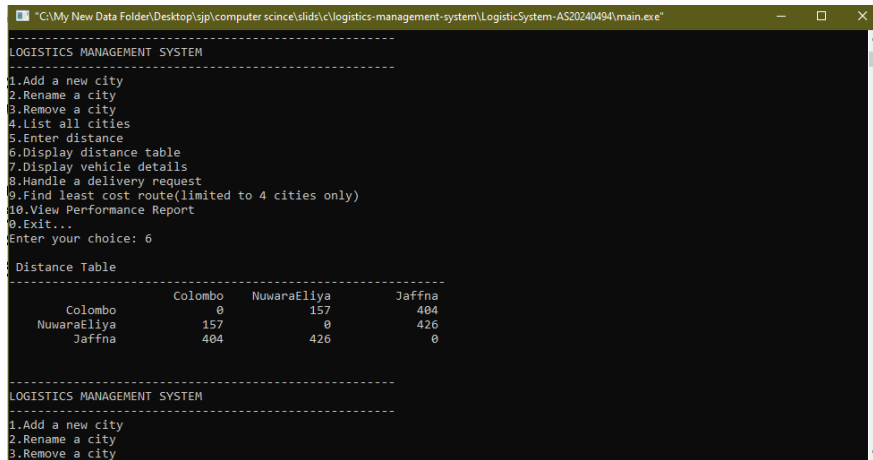
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 5

You added cities..
1 Colombo
2 NuwaraEliya
3 Jaffna
Enter 1st city: 1
Enter 2nd city: 3
Enter distance between Colombo and Jaffna in km: 404
Distance added successfully...

LOGISTICS MANAGEMENT SYSTEM
-----
```

Shows how the user enters or edits the distance between two selected cities.

Figure 7: Distance Table Display



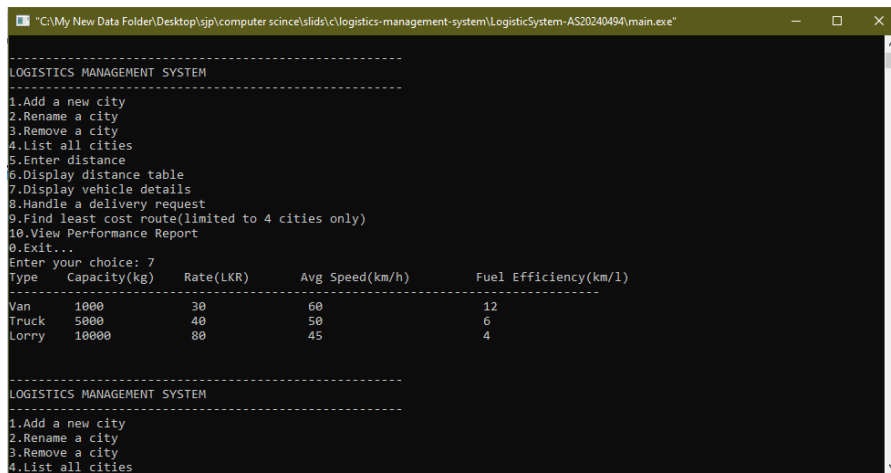
```
"C:\My New Data Folder\Desktop\sjp\computer science\slids\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 6

Distance Table
-----
      Colombo      NuwaraEliya      Jaffna
Colombo      0      157      404
NuwaraEliya  157      0      426
Jaffna       404      426      0

LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
```

Displays the full distance table.

Figure 8: Vehicle Details Display



```
"C:\My New Data Folder\Desktop\sjp\computer science\slids\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 7
Type      Capacity(kg)      Rate(LKR)      Avg Speed(km/h)      Fuel Efficiency(km/l)
-----
Van        1000           30           60           12
Truck      5000           40           50           6
Lorry      10000          80           45           4

LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
```

Shows details of all available vehicles, including capacity, rate, average speed, and fuel efficiency.

Figure 9.1: Handle a Delivery Request

```
"C:\My New Data Folder\Desktop\sjp\computer science\slids\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"

LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 8

You added cities..
1 Colombo
2 NuwaraEliya
3 Jaffna
Enter source city number: 1
Enter destination city number: 2
Enter weight(kg): 900
Type    Capacity(kg)    Rate(LKR)    Avg Speed(km/h)    Fuel Efficiency(km/l)
-----
Van      1000                30           60                 12
Truck    5000                40           50                 6
Lorry    10000               80           45                 4
Choose your vehicle(Enter number: Van=0 ,Truck=1, Lorry=2)): 0
```

Figure 9.2:

```
"C:\My New Data Folder\Desktop\sjp\computer science\slids\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"

Enter weight(kg): 900
Type    Capacity(kg)    Rate(LKR)    Avg Speed(km/h)    Fuel Efficiency(km/l)
-----
Van      1000                30           60                 12
Truck    5000                40           50                 6
Lorry    10000               80           45                 4
Choose your vehicle(Enter number: Van=0 ,Truck=1, Lorry=2)): 0

=====
DELIVERY COST ESTIMATION
=====
From: Colombo
To: NuwaraEliya
Minimum Distance: 157.00 km
Vehicle: Van
Weight: 900.00 kg
-----
Base Cost: 5133.90 LKR
Fuel Used: 13.00 L
Fuel Cost: 4855.83 LKR
Operational Cost: 9189.73 LKR
Profit: 1283.47 LKR
Customer Charge: 10473.21 LKR
Estimated Time: 2.62 hours
=====

LOGISTICS MANAGEMENT SYSTEM
```

Shows how a delivery request is entered, validated, and processed by the system.

Figure 10: Finding Least Cost Route

```
"C:\My New Data Folder\Desktop\sjp\computer science\slides\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 9

You added cities..
1 Colombo
2 NuwaraEliya
3 Jaffna
Enter start city number: 1
Enter end city number: 3

The Least-Cost Route(Least-Distance):
Colombo -> Jaffna
Minimum Distance: 404 km

-----
LOGISTICS MANAGEMENT SYSTEM
```

Displays how the system calculates and shows the shortest or least-cost route between two cities.

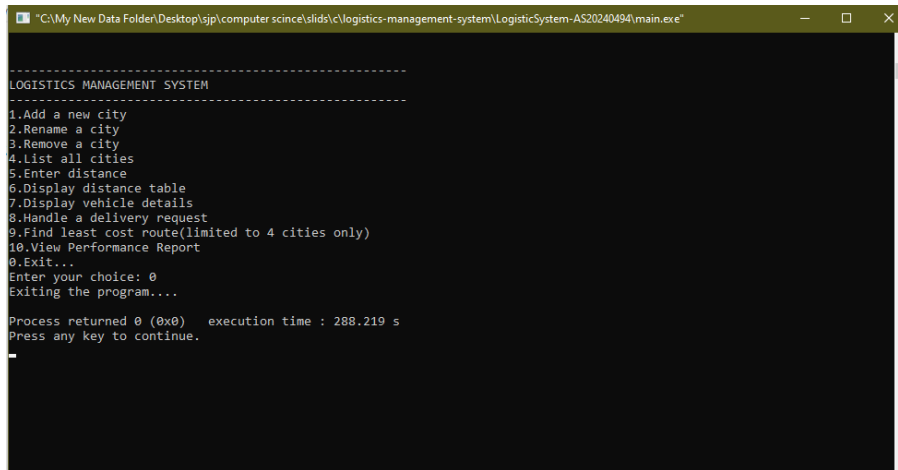
Figure 11: Report Generation Output

```
"C:\My New Data Folder\Desktop\sjp\computer science\slides\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 10

=====
DELIVERY PERFORMANCE REPORT
=====
Total Deliveries Completed : 2
-----
Total Distance Covered : 561.00 km
Average Delivery Time : 4.94 hours
-----
Total Revenue : 43304.33 LKR
Total Profit : 4951.20 LKR
-----
Longest Route Distance : 404.00 km
Shortest Route Distance : 157.00 km
=====
```

Shows the final performance report, including total deliveries completed, total distance covered, average delivery time, revenue, profit and the longest and Shortest Routes distance.

Figure 12: Exit the program



```
"C:\My New Data Folder\Desktop\sjp\computer science\slides\c\logistics-management-system\LogisticSystem-AS20240494\main.exe"
LOGISTICS MANAGEMENT SYSTEM
-----
1.Add a new city
2.Rename a city
3.Remove a city
4.List all cities
5.Enter distance
6.Display distance table
7.Display vehicle details
8.Handle a delivery request
9.Find least cost route(limited to 4 cities only)
10.View Performance Report
0.Exit...
Enter your choice: 0
Exiting the program....
Process returned 0 (0x0)   execution time : 288.219 s
Press any key to continue.
```

8. Conclusion

This project successfully simulates a simple logistics management system using C programming concepts. Through this project, I improved my understanding of arrays, functions, conditional statements, and modular programming. The system shows how programming can automate real-world logistics operations efficiently and accurately.