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Bridging Boundaries, Connecting Minds

CCP4213
Data Structure & Algorithms

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Project Title:
Car Renting System

BY

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Introduction

In these modern days, convenient and reliable transportation is essential for both personal needs. A Car Renting System provides users with an efficient platform to rent vehicles easily and securely.

Objective

Making a simple and streamline process of renting cars for both administrations and customers to save their time for rental cars . Which allows renters to easily search and request cars and enable administrations to add, update and delta car records.

Target User

Car Rental Business Owners & Administrators

- Manage car inventory (add, edit, delete cars).
- Track recently added cars using a stack.
- Use a hash table for quick car searches.
- Process rental requests via a queue system.

Customers (Car Renters/Buyers)

- Browse available cars.
- Search for specific cars.
- Request car rentals.

Scope

- User Management: Admins and renters with distinct roles and permissions.
- Car Inventory Management: Addition, modification, and removal of cars from the system.
- Rental Processing: Handling customer rental requests and processing them sequentially.
- Search and Lookup: Efficient search functionality using a hash table.
- Data Organization: Use of structured data storage methods, including linked lists, stacks, and queues.
- Usability and Accessibility: Providing a user-friendly interface for seamless interaction.

Program Features

Admin

- Add a New Car – Admins can add new cars to the system with details like ID, model, brand, and rental status.
- Remove a Car – Allows deletion of cars from the system.
- Update Car Details – Admins can modify car details.
- Process Rental Requests (FIFO Order) – Ensures first-come, first-served rental processing.
- View All Available Cars – Displays a sorted list of cars ready for rental.
- View Processed Rental Requests

```
********** ADMIN MENU **********
1. Add New Car
2. Display All Cars
3. Search Car
4. Edit Car Details
5. Delete Car
6. Process Specific Rental Request
7. View Processed Rental Requests
8. Return to Main Menu
**************************************************
Enter choice:
```

```
Enter Car Details:
ID: 1
Model: SUV
Color: RED
Year: 2024
Price per day: 500
--------------------------------------------------
[Success] Car added successfully!
```

```
Enter new details (enter current value to keep unchanged):
Model (SUV): MPV
Color (RED): BLACK
Year (2024): 2025
Price (500): 1000
--------------------------------------------------
[Success] Car updated successfully!
```

```
--------------------------------------------------
Pending Rental Requests:
[0] Car ID: 1 | Duration: 1 day(s)
--------------------------------------------------

Enter the index of the rental request to process: 0

--------------------------------------------------
[Processing] Rental for Car ID: 1
Rental Duration: 1 day(s)
--------------------------------------------------
[Success] Rental processed and car removed from system.
```

```
------------------------------------------------
Available Cars (Sorted by ID):
ID: 1 | Model: MPV | Color: BLACK | Year: 2025 | Price per day: RM1000
------------------------------------------------

------------------------------------------------
Recent Added Cars (Most Recent First):
ID: 1 | Model: MPV
------------------------------------------------
```

```

--------------------------------------------------
Enter Car ID to delete: 1
--------------------------------------------------
[Success] Car deleted successfully!
```

```
--------------------------------------------------
Processed (Booked) Rental Requests:
Car ID: 1 | Model: MPV | Rental Duration: 1 day(s)
--------------------------------------------------
```

RENTAL

- Request a Car Rental – Customers can request to rent an available car.
- View All Available Cars – Displays a sorted list of cars ready for rental.
- View Pending Rental Requests
- View Processed Rental Requests

```
****************** RENTER MENU ******************
1. View Available Cars
2. Search Car
3. Request Rental
4. View Pending Rental Requests
5. View Processed Rental Requests
6. Return to Main Menu
*************************************************
Enter choice:
```

```
-----------------------------------------------
Available Cars (Sorted by ID):
ID: 1 | Model: MPV | Color: BLACK | Year: 2025 | Price per day: RM1000
-----------------------------------------------
```

```
Enter Car ID to rent: 1
Enter number of rental days: 1

[Info] Rental request submitted for Car ID: 1 for 1 day(s).
[Info] Total Amount: RM1000
```

```
-------------------------------------------------
Pending Rental Requests:
[0] Car ID: 1 | Duration: 1 day(s)
-------------------------------------------------
```

```
-------------------------------------------------
Processed (Booked) Rental Requests:
Car ID: 1 | Model: MPV | Rental Duration: 1 day(s)
-------------------------------------------------
```

Data Structure and Algorithms

The data structures that were utilized in this Car Renting System :

- Linked List
- Queue
- Hash Map
- Stack

Linked List (Available Cars Management)
A linked list is used to store information about cars, where each node represents a car with its unique ID and availability status such as rented or available. This allows efficient addition and removal of cars, keeping the availability list dynamic.

Queue (Rental Request)
A queue is implemented to manage rental requests in a First In, First Out (FIFO) manner. This ensures that rental requests are processed in the order they were received.

Hash Map (Fast Car Lookup)
A hash map is used to store and quickly retrieve car details using a unique car ID as the key. This allows for efficient lookups and avoids the need to traverse a list when searching for a specific car.

Stack (Store Car)
A stack is used to manage the return process of rented cars. The stack follows the Last In, First Out (LIFO) order, meaning that the most recently add car will be store to the data storage and display it stack by stack.

Reference

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