Parking Lot Entry Tracker

Programming Data Structures and Algorithms

Higher National Diploma in Software Engineering

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1. Introduction

We propose developing a **Parking Lot Entry Tracker Tool** that utilizes the Queue data structure to manage car entries efficiently. This tool allows vehicles to line up in a First-In-First-Out (FIFO) order, ensuring that the first car to arrive is the first to enter when a parking slot becomes available. The system provides a transparent way to handle parking in busy areas, avoiding confusion and ensuring fair entry management.

2. Functional Requirements

2.1 Input Requirements

- Enter car number plate into the queue
- Record time of arrival
- Add/remove cars from the waiting queue
- Update parking slot availability

2.2 Process Requirements

- Add car to queue (Enqueue)
- Remove car from queue when slot is free (Dequeue)
- View next car waiting (Peek)
- Check if queue is empty
- Search car by number plate
- Count total cars in queue
- Generate token number for cars
- Update available parking spots
- Update queue display

2.3 Output Requirements

- Display current waiting queue
- Show which car is next to enter
- Display available parking slots
- Show notification for entry → e.g., “Car XYZ-1234 → Please Enter.”
- Confirm car entry and update queue
- Display estimated waiting time (optional)

3. Data Structure Used and Justification

Data Structure: Queue

Justification: Queue is the ideal choice for this parking lot tool because it follows the FIFO principle, ensuring that cars are allowed entry in the exact order they arrived. This ensures fairness and avoids disputes. The operations of adding a new car to the line or removing the next car when a slot is free can be performed in O(1) time, making it efficient. This matches real-world parking scenarios, where the first car waiting should always get the first available slot.